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American Electro-Platers' Society Holds Annual Meeting in Cleveland

A Report of the 24th Annual Convention. Record Attendance. Society Decides to Appoint Full-Time Executive Secretary.

THE Annual Convention of the American Electro-Platers' Society was held in Cleveland, Ohio, June 1-4th at the Carter Hotel. All records for registration were broken, the total being 546.

In actual fact, the Convention began on Sunday morning, May 31st, when the delegates began to arrive, although the official opening took place at 9 A. M., Monday morning, when the delegates were welcomed at the first session held in the Grand Ball Room. Among the prominent welcomers was Mayor Harold H. Burton of Cleveland, who extended the traditional "key" to the city.

Executive Secretary To Be Appointed

The first business of the Convention, after the presidential address by Thomas F. Slattery, was the

E. STEEN THOMPSON,
President,
A.E.S.

JOHN C. OBERENDER,
President,
I.F.C.

presentation of credentials and the submission of amendments to the Constitution. At this session the organization took under consideration a motion emanating from the Baltimore-Washington Branch, to amend the Constitution to provide for the employment of a full-time executive secretary, to perform the present duties of the secretary and editor, and other duties pertaining to the headquarters' office of the Society. At the session on Thursday afternoon, June 4th, this motion was passed.

WALTER FRAINE, Honorary Member, A.E.S.

New Officers

The officers elected for the coming year were the following:

President: E. Steen Thompson, Cleveland Branch.

First Vice-President: Patrick J. Sheehan, Milwaukee Branch.

Second Vice-President: James Hanlon, Chicago Branch.

Plant Visitations

Plant visitations were held on Tuesday morning to the Goodyear Tire and Rubber Company of Akron and the Cleveland Division of the Fisher Body Corporation; and on Wednesday afternoon to the National Carbon Company and the General Electric Company. All of these visits were most interesting and instructive.

Social Events

Social events including the annual Open House of the International Fellowship Club on Monday evening, a picnic for the men and the ladies on Tuesday afternoon, June 2, at which athletic events, games, etc., were held, and the annual banquet and dance on Thursday evening June 4th. All of these events were hugely enjoyed. Over 600 people attended the annual banquet. The Open House party of the International Fellowship Club was voted a great success, being attended by practically the entire membership together with their ladies. In the words of the H-VW-M Official Convention News, published by the Hanson-Van Winkle-Munning Company of Matawan, N. J., daily during the convention, "The floor was buffed to a high lustre, the orchestra had exceptional throwing power, the refreshment committee provided chemicals in large quantities and solutions were easily maintained at maximum efficiency!"

T. A. TRUMBOUR, Secretary-Treasurer, I.F.C.

I. F. C. Officers

Incidentally the new officers of that wide-awake organization, the International Fellowship Club for the coming year, are:

President: John C. Oberender, Zapon Company, Stamford, Conn.

Vice-President: Paul M. Savage, McGean Chemical Company, Cleveland, Ohio.

Secretary-Treasurer: Thomas A. Trumbour, Metal Industry Publishing Company, N. Y.

Prize Awards

The list of prizes and awards grows year by year, just as the Society itself grows. The following are this year's prizes and the recipients.

Founder's Gold Medal: Walter R. Meyer, Bridgeport Branch.

American Electro-Platers' Society Medal: Dr. D

JOSEPH P. SEXTON, Awarded 3rd Prize for Individual Exhibit

A. Cotton, Anderson Branch.

Metal Industry Cup for the best Branch Exhibit of plated work: **Bridgeport Branch,** for the second year in succession.

Individual Exhibits:

First prize, Joseph Singler, Cleveland Branch.
Second prize, W. D. Scott, Cleveland Branch.
Third prize, J. P. Sexton, Bridgeport Branch.

Among the special events of this convention was the election of two members of the Society to Honorary Membership. The new honorary members are **Walter Fraine,** Dayton Branch, Past President of the A. E. S. and Associate Editor, Metal Industry, and **Daniel Wittig,** Milwaukee Branch.

Other honors, not so serious perhaps, but most enjoyable nevertheless, went to the baseball team from West, which trimmed its old-time enemy, the East by a score of 12 to 4. However, the East was revived through the efforts of **T. H. Chamberlain** of New Haven, Associate Editor of Metal Industry,

who brought home the golf championship.

One of the most interesting features of the convention was the fact that of the 20 presidents of the American Electro-Platers' Society, 12 attended this convention. It is a fact also that all of the past presidents are living, from which perfectly clear inferences can be drawn as to the "hazards" of the plating industry.

No Exhibits for Five Years

It was decided that no more exhibits of equipment and supplies would be held at the A. E. S. conventions for the next 5 years.

1937 Convention

The 1937 Convention of the Society will be held in New York. Cleveland has given New York a very high mark to shoot at.

THE PROGRAM IN RHYME

By Hedley J. Richards

Come platers and friends from far and near,
You all are invited to Cleveland this year
To our 24th Annual Convention.
June the 1st to the 4th are the days that we meet
And the program each day simply cannot be beat.
It's worth all your time and attention.

Registration and speeches, the first morning share,
From William D. Scott and his honor the Mayor,
And Slattery, our own President.
Then amendments and business will be on debate,
For our laws we all know must be kept up to date.
This surely is quite an event.

Education then starts in the Hotel Ball Room,
Started out as is right by our friend, Dr. Blum.
Exposure tests then have their turn.
How much iron can be plated in one little hour
And the practical factor of good throwing power
Of metal rectifiers then we learn.

The International Fellowship Club then meets
And takes the first evening with dancing and eats,
Entertainment and frolic and fun.
You all will have tickets to this great affair,
You'll have a great time, you just have to be there.
And so the first day is done.

On Tuesday we start with a plant visitation,
To plants that are known over all of the Nation,
Where Fisher bodies are made.
And then comes a luncheon right on the lake shore,
And swimming and golfing are pleasures in store,
And our yearly baseball is played.

Tuesday evening we're led in the pathways of science
By men we respect and in whom we've reliance
With George Hogaboom in the chair.
We study the basic cathode solutions.
And how to make tungsten plating solutions,
And two other papers we share.

Wednesday morning, how to plate tin we are told,
Antimony, tellurium, silver and gold,
Aluminum, nickel and lead.
We learn of corrosion of parts that are used,
And how such corrosion can be much reduced,
These things you must get in your head.

Ductile nickel comes next, either thin or quite thick
And how to brass plate so that rubber will stick.
Every day we instruct and amuse.
A vist comes next, not a thing's left to chance,
To either of two immense, wonderful plants,
You are taken to which one you choose.

June the 4th has the last educational session,
Six valuable papers, each one has a lesson,
An educational treat.
New laws are then chosen or may be rejected
And officers for next year are duly elected
And we choose where next year we will meet.

Let us all have objectives, sublime, elevating,
For brotherly love and advancement in plating.
Whether at work or at play.
Whatever your lot or your job is demanding,
May God's peace which passeth all understanding,
Be with you all every day.

Technical Papers Presented

Abstracted by
WALTER R. MEYER

SUMMARY OF RESEARCHES ON ELECTRODEPOSITION AT THE NATIONAL BUREAU OF STANDARDS

By Dr. William Blum
National Bureau of Standards, Washington, D. C.

The completed exposure tests on electroplated coatings on ferrous metals was reported. The American Electro-Platers' Society, in conjunction with The National Bureau of Standards and The American Society for Testing Materials reported the results in the Bureau of Standards Research Paper, No. 867. Work is being continued at the Bureau on the accuracy of drop tests for measuring thicknesses of electroplated zinc coatings as well as sherardized and hot-galvanized coatings. Numerous tests on methods for determining the adhesion of electroplated coatings were tried and the Ollard ring method was recommended for the most accurate results. Jacquet's method for determining adhesion by measuring the force required to pull a one centimeter electrodeposit from the basis metal proved to be more convenient to use than the Ollard method, but was not as reliable. A study is now being made at the Bureau to determine the nature of the complex cyanide ions existing in copper cyanide plating solutions.

EXPERIENCE IN THE PLATING OF NON-FERROUS METALS FOR EXPOSURE TESTS

By P. W. C. Strausser
A. E. S. Associate, National Bureau of Standards, Washington, D. C.

Difficulties which arose during the plating of approximately 6,000 panels for the exposure tests of coatings on non-ferrous metals were presented. It was reported that air agitation helped to eliminate pitting in the deposition of nickel, and at the same time a whiter deposit could be obtained. Adhesion of nickel deposits to malleable iron could be improved by applying a copper under-coat. It was found that

an increased amount of blistering occurred when copper was deposited directly upon zinc base die castings or when copper was deposited between two nickel electrodeposits. No explanation of this phenomenon was offered. It was also found that this difficulty varied considerably with the type of die casting used.

THE RAPID ELECTRODEPOSITION OF IRON

By Dr. C. Kaspar

U. S. Bureau of Standards, Washington, D. C.

Solutions for the rapid deposition of iron from solutions containing ferrous chlorides, calcium chloride and boric acid were presented. The operating temperature was 190 degrees Fahrenheit and current densities up to 50 amperes per square foot were used. The baths had to be strongly acidic containing hydrochloride acid in concentrations from .05 to .25 normal. Armco Ingot Iron was used as anodes, but the iron had to be bagged with asbestos bags of special composition to prevent the carbon from causing rough deposits. When high current densities are used, such as from 100 to 300 amperes per square foot, shielding is necessary to get a uniform distribution of the plated coating. The ductility of the electrodeposited iron varied with the acidity, temperature, and current density used.

THE COMMERCIAL AND PRACTICAL ASPECTS OF THROWING POWER AS A FACTOR IN THE CHARACTER OF DEPOSITS

By Donald Wood

Reed & Barton Co., Taunton, Mass., President of Boston Branch, A.E.S.

The distribution of silver electrodeposits or the "throwing-power" of silver solutions on white metal alloys containing 90% tin and on 10% nickel silver was shown to be a function of the cathode polarization and this in turn was a function of the size of the crystals of the basis metal. Fine grained metal showed a different initial cathodic polarization than coarse grained material, but the same equilibrium polarization value was obtained for both the fine and coarse grained material after sufficient silver had deposited to give a uniformly distributed coating.

METAL RECTIFIERS

By Dr. R. M. Wick

U. S. Navy Yard, Brooklyn, N. Y.

The observations made by Dr. Wick during his trip in England on the use of metal rectifiers were presented. Metal rectifiers with a total capacity of one hundred thousand amperes have been installed, and the number of installations in England is considerable. The rectifiers are of the cuprous oxide type and show a progressive loss in output over the course of several years usage. When three phase current is used, the ripple is of the order of 7%. When the loading is above 30%, efficiency is as high as 75%, but when the loading drops below this value the efficiencies may be as low as 45%. The power factor of metal rectifiers is as good as is obtained with induction motors, but not as good as the values obtained with synchronous motors. The voltage control is more difficult than the control with motor generator sets and the rectifier must be kept scrupulously clean and be either air cooled or cooled with oil or water. In the discussion following the paper, it was brought out that the costs of installation for the same output capacity of motor generator sets and metal rectifiers are approximately the same. The favorable comparison between rectifiers and motor generator sets used in England is more favorable for the comparison in England because of their use of induction motors rather than the synchronous type used in this country.

THE ORIENTIVE EFFECTS OF THE GEOMETRICAL AND CRYSTALLINE STRUCTURE OF THE BASIS CATHODE ON THE CRYSTAL STRUCTURE OF ELECTRODEPOSITS

By Walter R. Meyer

Electrochemist, General Electric Company, Bridgeport, Conn.

The orientive influences of the geometrical and crystalline structure of the basis metal cathode were depicted by the presentation of 50 photomicrographs. The limiting factors such as current density for the continuation of the crystal structure of the basis metal by the electrodeposit for copper on copper were determined and continuation of geometrical structures for over 100 successive coatings of nickel upon nickel and cadmium upon cadmium were presented. A consideration of the most densely packed crystallographic plane for continuation of the crystal structure of copper upon copper and zinc upon zinc showed that the probability of continuation of basis metal structure was greater with copper because the most densely packed plane is the octahedral or the (111) plane. The anisotrophic crystallographic structure of zinc accounts for the difficulty in obtaining the extension of the crystal structure of zinc upon zinc because of the low probability of favorable orientation of the basal or most densely packed (0001) planes. The retarding influences of oxide films on the extension of basis metal crystals by electrodeposits were shown to be a function of the rate of oxide formation, the difficulty in removing the oxide and the manner of the electronic arrangement in the oxide.

THE PRESENT STATUS OF THE ELECTRODEPOSITION OF TUNGSTEN FROM AQUEOUS PLATING SOLUTIONS

By M. L. Holt

Instructor of Chemistry, University of Wisconsin

The electrodeposition of tungsten from hot aqueous sodium carbonate solutions necessitated the co-deposition of another metal such as iron or nickel. The amount of tungsten deposited from commercial tungstic acid varies because of the variation in the amount of metallic impurities in the different commercial tungstic acids. When the solutions were depleted of iron or nickel, the deposition of tungsten ceased and the renewed deposition could be brought about by the addition of a very small amount of iron or nickel. In all cases the amount of alloyed iron or nickel is considerable. The cathode efficiency of the bath is low, the deposits are thin and do not have the excellent resistance to acids which is characteristic of pure tungsten.

POLISHING GRAIN AND ITS APPLICATION

By Roy Lincoln

Chemical Engineer, The Carborundum Company, Niagara Falls, N. Y.

Motion pictures were presented illustrating the manufacture of silicon carbide abrasive and the preparation of the many wheels used in commercial work.

FILMS AND THEIR RELATION TO CLEANING BEFORE ELECTROPLATING

By C. Johnson

Technical Director, Oakite Products, Inc., New York

The relationship between the various types of films and the technique used in cleaning was considered in detail. Continuous films, discontinuous films of solid particles, and water repellant films were considered. Films consisting of solid particles can be removed by wetting the particles with an emulsifiable solvent cleaner followed by a rinse in cold water, but when the solid particles initially do not contain any oil, this technique will not remove the solid particles from the work. Water-breaks caused by soap may be recognized by immersing the work in the alkaline cleaner for a few minutes. If the film is due to oil contamination, no water-break will then be seen, but if the water-break is due to a soap film it will be seen after continued immersion in the alkaline cleaner. The subject of films is a considerable one and reference was made to a complete literature survey by W. R. Meyer appearing in the May issue of Metals and Alloys.

RESULTS OF THE ELECTROPLATING RESEARCH AT INDIANA UNIVERSITY INCLUDING PLATING OF TIN, ALUMINUM, BISMUTH, ANTIMONY, TELLURIUM, SILVER, GOLD, LEAD AND NICKEL

By Dr. F. C. Mathers

University of Indiana, Bloomington, Ind.

The research work done at Indiana University was reported for the following metals: bismuth, tellurium, copper, nickel, antimony, lead, silver and tin. The smoothness of the metals just mentioned when deposited from solutions of the same type varies progressively rough from bismuth to tin. Iodine and chlorine were found in many electrodeposits which were deposited from solutions containing these ions. Tellurium can be deposited from a chloride solution but only initially upon lead due to the strong acids used in the tellurium plating solution. The deposition of magnesium from Grignard reagents was reported but deposition from aqueous solutions has not been successful. Bismuth may be deposited from a perchlorate bath without the use of addition agents. Peptone, clove oil and dithionates may be used to improve the character of the deposit. Perchlorates are most suitable in lead solutions because of the insolubility of most other salts. Good deposits of silver were reported to have been obtained from nitrate solutions containing tartaric acid. The use of fish oil on chromium plating solutions to reduce spray loss was recommended. Aluminum cannot be deposited from aqueous solutions but may be deposited from a solution containing aluminum bromide, aluminum chloride, ethyl bromide, benzene and xylene. The solution must be carefully protected from contamination by water, but removal of oil and grease is not as essential as in normal plating solutions because the solution acts as a solvent for the oils.

CALCIUM CHLORIDE CORROSION OF PLATED AUTOMOTIVE PARTS CAN AND SHOULD BE REDUCED

By Dr. E. M. Baker

University of Michigan, Ann Arbor, Mich.

The use of calcium chloride for removing ice from the streets during the winter months has resulted in pronounced corrosion of automobile parts which were sprayed by the slush containing the calcium chloride. It was reported that the use of sodium chromate or dichromate would eliminate this condition if used in concentrations of 10 grams per liter upon 100% weight of calcium chloride. The added cost per ton of calcium chloride used with the addition of the proper amount of sodium chromate would be approximately 35c per ton.

SOME FACTORS COVERING THE DUCTILITY OF NICKEL ELECTRODEPOSITS

By E. A. Anderson

Chief Metal Section, Research Division,
New Jersey Zinc Company, Palmerton, Pa.

The addition of carbon dioxide or carbonates to nickel plating solutions resulted in the production of cracks in the electrodeposits from these baths. The carbon dioxide present in the air is not sufficient to contaminate the baths so that difficulty will be obtained, and it is believed that such contaminations may result from impurities in the salts used. It was also reported that ductile nickel deposits were obtained when the operating slip planes (111) were oriented parallel to the surface of the cathode. In this position, slip could occur most easily and hence deposits of this type would be ductile. Deposits which have the dodechedral planes (110) oriented parallel to the surface of the basis cathode would not offer as favorable an orientation for slip upon deformation.

BRASS PLATING FOR RUBBER ADHESION

By Dr. Harry P. Coates

Firestone Steel Products Company, Akron, Ohio

The effects of the variations in bath compositions and operating conditions upon the cathodic efficiencies and the composition of the resulting deposits were reported in relation to their effects upon the adhesion of rubber to the surface coated with the respective brass electrodeposits. Crystal size is relatively unimportant but the ratio of copper to zinc in the electrodeposit has a marked influence upon the adhesion of the rubber to the brass coating. The variations in the ratios of copper to zinc to secure good adhesion are different with the different types of rubber used. The general ratio of copper to zinc for good adhesion was 24 to 34% zinc and the balance copper. The adhesion of rubber to beta brass is particularly poor and hence the amount of zinc should never exceed 38%.

THE EFFECT OF NICKEL CHLORIDE IN NICKEL PLATING SOLUTIONS

By M. Waite

Director of Research
McGean Chemical Company, Cleveland, Ohio

The equilibrium pH of nickel chloride solutions decreased with increasing concentration of nickel chloride. Harder deposits were obtained with increasing nickel chloride concentration and the effects are reversed as the temperature is raised.

THE PROPERTIES OF FUSED ALUMINA GRAIN FOR POLISHING

By A. A. Klein

The Norton Company, Worcester, Mass.

Specifications for polishing grains were presented and the factors involved in screening and particularly the selection of the screens were carefully detailed.

Capillarity is an important factor in determining the strength of adhesion of glue to the abrasive, and the degree of capillarity may be measured by determining the height that water will rise in a tube containing the abrasive. Capillarity decreases on storage of the abrasive due to the adsorption of a film of oil. The shape of the grain must be carefully considered and the choice of abrasive used for the various applications, and, for example, a rounded or wedge shaped grain may be satisfactory for polishing wheels but would be unsatisfactory for sand paper. Etching of the faces of the abrasives to roughen the surfaces will result in better adhesion.

STABILITY OF PLATING SOLUTIONS

By Gustaf Soderberg

The Udylite Company, Detroit, Mich.

A correlation of the effects of drag-out, anodic efficiency and cathodic efficiency was made to determine the factors necessary for a balanced plating solution. A withdrawal time of sixty seconds will reduce the amount of material removed by drag-out 200% over the amount removed during a ten second withdrawal time. In the discussion it was stated that viscosity and surface tension had an influence upon the amount of material removed, but these amounts were not proportional to the changes in the values of viscosity and surface tension.

EFFECT OF POLISHING CORROSION RESISTANCE

By William M. Phillips

General Motors Corp., Detroit, Mich.

Chairman, Research Committee, A. E. S.

Differences in salt spray resistances of body steel polished with various grit sizes were carefully studied. Two types of coating were used, one being copper .0005 inches and nickel .0005 inches, and the other .001 inches, but the results were not significally different for the two types of coating. After eight days of continuous exposure to salt spray it was noticed that the specimens which were not polished but only buffed had better corrosion resistance than the specimens polished with emery. When emery was used grooved, fine pin-holes were obtained for the grits less than 180 mesh, but for the finer grits isolated spots were obtained. The conclusions drawn were that as little polishing as possible should be used and hence the use of highly finished steel should be encouraged.

ELECTRODEPOSITION OF ZINC AND ITS PROTECTIVE VALUE

By George B. Hogaboom

Hanson-Van Winkle-Munning Company, Matawan, N. J.

A critical study of the effects of variations in bath composition of alkaline zinc plating solutions on the crystal structure of the zinc deposits obtained from them was made with a correlation of thickness determinations by the drop test and microscopic methods. Solutions containing high cyanide and low caustic soda contents gave the best throwing power but had low cathodic efficiency, and conversely solutions containing low cyanide and high caustic soda gave poorer throwing power but higher cathodic efficiency. The electrical resistance of the solutions varied markedly with the caustic soda content, as, for example, a four ounce solution had a resistance of 13 Ohms, while a solution containing 14 ozs. per gallon had a bath resistance of 4 Ohms. Using the same conditions of operation with reference to current density and temperature, solutions of different compositions gave marked variations in cathodic efficiencies when calculated, first by the drop test and secondly, by microscopic measurement. The variation in reaction velocities of the drop test solution with different types of the electrodeposits may be attributed to differences in crystal structure of the zinc coating. Cathodic efficiencies calculated as high as 120%, using the data from the drop tests, whereas the cathodic efficiency for the same specimen using microscopic measurements were calculated to be 87%.

THE ELECTRODEPOSITION OF NICKEL ON ZINC

By J. M. Cosgrove

Chief Chemist, Noblitt-Sparks Industries

The problems attendant with the deposition of nickel on zinc base die castings from sulphate solution were considered. An acid dip containing nickel was recommended previous to immersion in the nickel plating solution. This solution contained one-half an ounce of nickel per gallon and 5% hydrofluoric acid. When the die castings are immersed in this solution, a film of nickel is deposited by immersion and some undercutting due to the etching action of the acid results so that better adhesion of the subsequently deposited nickel is obtained.

BUFFER ACTION OF CERTAIN CHEMICALS IN RELATION TO pH CONTROL OF NICKEL SOLUTIONS

By Dr. A. Cotton

Director of Research

Delco-Remy Corporation, Anderson, Ind.

The buffering action of boric acid, sodium acetate and acetic acid, citric acid and sodium citrate, and many organic acids such as succinic, formic and tartaric was studied. Boric acid acts only as a buffer in the pH range above 5, but for pH's below 5, boric acid exerts no more buffering action than distilled water. Acetic acid and sodium acetate act as buffers in the pH range from 5.5 to 3.00. Their buffering action is greater in nickel solutions containing 12 oz. per gallon of nickel than in solutions containing 6 oz. per gallon of nickel, probably due to the buffering action of the nickel salt. However, for citric acid and sodium citrate, the buffering action is less in the stronger solution than in the weaker.

THE EFFECT OF COMPOSITION AND STRUCTURE ON CORROSION OF NICKEL ANODES

By A. G. Spencer

Metallurgist, Chevrolet Motor Company, Flint, Mich.

The influences of impurities and the crystal structure of anodes on their manner of corrosion and degree of corrosion were considered. Oxygen forms a eutectic of nickel-nickel oxide at low concentration, and hence the oxygen content should be kept low in the anodes to prevent the formation of hypereutectic structures. Carbon remains in solid solution in quantities less than .1% and in greater amounts separates chiefly along the grain boundaries and to some extent in the bodies of the crystals. Iron is not particularly harmful in respect to corrosion because it forms a solid solution with the nickel but if large amounts are carried into the plating solution, it may precipitate out and lead to pitting. Silicon dissolves readily in the nickel and is bene-

ficial because it forms a gell which tends to hold the carbon sludge and nickel particles at the anode. Cathode sheets are not satisfactory as anodes because they have a layered structure and hence tend to plate and give a high scrap loss.

PROCESS CONTROL AND FINISHING COSTS

By H. L. Farber
Chief Chemist
Westinghouse Electric Company, Mansfield, Ohio

The factors which must be considered in cost studies of finishing were presented. Some approximate costs for finishing materials for one square foot followed: Nickel plating $.0019; chromium plating $.0053; hot tin dipping $0.0313; synthetic enamel $0.0030; primer coating $0.0053; intermediate coating $0.0087; finished coating, $0.0115; japanning $0.0019; vitreous enamel $0.0230.

COMPARATIVE VALUATION OF MODERN FINISHES

By W. Roon
Technical Director
Roxalin Flexible Lacquer Company, Elizabeth, N. J.

The use of new resins of the vinyl, alkyd and phenolic types in lacquer formulation was considered. The adhesion of lacquers, aging qualities and resistance to corrosive atmospheres were considered in the light of modern development.

Exhibitors' Literature

Advance Polishing Wheels, Inc., 844 W. 49th Place, Chicago, Ill. Advance buffing wheels; rakes.

Belke Mfg. Company, 947 N. Cicero Avenue, Chicago, Ill. Small lot burnisher; carboy emptying device; rheostats; filter press; mechanical plating barrels.

G. S. Blakeslee and Company, Cicero Station, Chicago, Ill. Solvent degreasing of zinc and aluminum die castings; automatic degreasing machines; Niagara and pump type washing machines.

Bruce Products Corporation, 5712 Twelfth Street, Detroit, Mich. Non-ridge polishing wheel; metal finishing materials for all requirements.

Columbia Electric Mfg. Company, 4519 Hamilton Avenue, Cleveland, Ohio. Low voltage generators for electroplating and other electrolytic processes; cast grid tank rheostats; instant current measurements with the Crompton tong test ammeter.

Detroit Rex Products Company, 13005 Hillview Avenue, Detroit, Mich. "The Largest Degreaser Ever Built"; simplified metal cleaning; cleaning department economy; industrial applications of Triad alkali cleaners.

Duriron Company, Inc., Dayton, Ohio. Heat exchanger; split flanged pipe; corrosion resistant alloy steel; chemical and physical characteristics of Duriron; centrifugal pump for acids and alkalies.

Egyptian Lacquer Mfg. Company, Inc., Rockefeller Center, 1270 Sixth Avenue, New York. Egyptian lacquer enamels for industrial products.

The Electric Products Company, Cleveland, Ohio. Motor generator plating sets.

General Abrasive Company, Niagara Falls, N. Y. Lionite polishing grains.

Globe Machine and Stamping Company, 1200 W. 76th Street, Cleveland, Ohio. "Another Burnishing Problem Solved by Globe"; tumbling barrels; metal stampings; grilles; finishing barrels for tumbling, burnishing and grinding at low cost.

B. F. Goodrich Company, Akron, Ohio. An improved Korolac, a Koroseal product.

Grasselli Chemical Company, Inc., 629 Euclid Avenue, Cleveland, Ohio. Announcing a new zinc molybdenum electroplating process; anodes, chemicals and equipment for cadmium, zinc, brass, lead, tin, copper, nickel and chromium plating; bright zinc; Hull and Strausser test for determining the thickness of cadmium and zinc deposits; chemicals, spray products, etc.; metal finishing: electroplating chemicals, equipment, pickling, galvanizing, tinning and soldering.

Hammond Machinery Builders, Inc., Kalamazoo, Mich. Rite-Speed electric polishing and buffing lathes; automatic polishing and buffing machines; electric grinders and polishers.

Hanson-Van Winkle-Munning Company, Matawan, N. J. Tanks; centrifugal dryers.

Haveg Corporation, Newark, Dela. "Chemical equipment that defies corrosion."

Jos. L. Howland Company, 341 Frankfort Avenue, N. W., Cleveland, Ohio. Jiffy expanding abrasive and polishing wheels.

Lasalco, Inc., 2822 LaSalle Street, St. Louis, Mo. Utility barrel plater; gear drive barrel platers; Bull's Eye plating barrel; cushioned belt grinder and polisher; ball burnishers; barrel platers; Bull's Eye Junior barrel plater; Richards rotary plater; semi-automatic conveyor; solution filter.

Lea Manufacturing Company, Waterbury, Conn. Nickel Glo for better barrel plating; buffing and polishing methods; reference book and instructive manual.

The McGean Chemical Company, 1106 Republic Bldg., Cleveland, Ohio. Tentative Specifications for Electrodeposited Coatings of Zinc, Cadmium, Nickel and Chromium on Steel; chemicals; nickel chloride; cadmium anodes; nickel carbonate; nickel salts.

J. C. Miller Company, Grand Rapids, Mich. Filter press; short arc reversing switch; buffing compositions; chromium anodes; dipping tanks; cleaners.

J. Nelson and Son, 830 N. Wells Street, Chicago, Ill. Patent cathode rod.

Nickel and Chromium Products Company, 250 Park Avenue, New York. "C and A" bright chrome salts; "Starbright" nickel salts.

Norton Company, Worcester, Mass. Refractory cements; facts about metal polishing; beautifying monuments with alundum abrasive; abrasives: their history and development; list prices of Norton grinding wheels and other bonded abrasive products; refractory bricks; Alundum and Crystolon.

Oakite Products, Inc., 24 Thames Street, New York. Discovering new production economies through simple changes in cleaning and related operations.

Puro Products Company, 2602 Payne Avenue, Cleveland, Ohio. Cleaners; grease solvents.

R. & H. Chemicals Department, E. I. duPont de Nemours and Company, Inc., Wilmington, Del. Modern metal finishing; the value of mercury in zinc plating; chemicals for modern metal treatment.

Roxalin Flexible Lacquer Company, Inc., 800 Magnolia Avenue, Elizabeth, N. J. Lacquers; "How Good Are You at Twisting and Bending," "Which of These Outstanding Lacquer Products Do You Want to Test?" Color chart for Venetian blinds; color chart.

Seymour Mfg. Company, Seymour, Conn. Seymour controlled grain anodes.

Standard Electrical Tool Company, 1938 W. Eighth Street, Cincinnati, Ohio. Selective speed buffing and polishing machine.

Frederic B. Stevens, Inc., Detroit, Mich. Standardized buffing compositions; Zucker pioneer rouges.

The Udylite Company, 1651 E. Grand Boulevard, Detroit, Mich. Plating and polishing equipment and supplies.

Master Electro-Platers' Institute

The Master Electro-Platers' Institute of the United States held its third annual meeting, June 1st and 2nd, at the Hotel Cleveland, Cleveland, Ohio.

After the routine reports, the question was taken up of undertaking an advertising campaign to further the interests of electroplating and electroplated products. It was the concensus of opinion of the meeting, however, that such a project would be too expensive to attempt at this time.

The improvements and gains made for the industry by the Institute were recognized and appreciated. The job plating has been recognized by manufacturers as an industry; trade discounts have been lowered generally from 2 per cent to 1 per cent; wages and prices have beeen raised broadly from the low point of the depression; a valuable bulletin of Specifications for Quality of Plated Coatings has been published; the Institute has stressed constantly the point of quality versus price to make manufacturers aware of the need for good plating.

It was decided that for the present at any rate, the local associations would carry on the work of keeping the industry organized. Three locals are functioning actively—the Master Electro-Platers' Association of the Mid-West, the Chicago Electro-Platers' Institute and the Masters' Electro-Plating Association of New York. These organizations will keep in touch with each other, exchanging information and cooperating.

Accelerated Cold Cracking Test for Finishes*

If a finishing system is to be resistant to failure by cold cracking and peeling, it must meet four very important requirements. These requirements are:

(1) The finish must have good initial adhesion to the substrate;

(2) The finish must be sufficiently impermeable to prevent large quantities of moisture from passing through the film and causing temporary loss of adhesion;

(3) The finish must not react with the substrate, otherwise permanent loss of adhesion may result;

(4) The finish must remain sufficiently flexible so that its co-efficient of expansion at low temperatures is at least equal to that of the substrate over which it is applied.

The need for an accelerated cold cracking test for evaluating finishes became very evident during the first three months of 1934. In studying this problem, it was first necessary to devise a test which, on a laboratory scale, could duplicate the cold cracking failure of finishes which was occurring in the field. Results of these tests made on panels finished with identical systems, but removed from the exposure racks at different times, were not consistent. This indicated that some other factor besides that of low temperatures was playing an important part in the cold cracking failure of finishes.

The other factor was apparently the presence of moisture, as panels removed immediately after a rain or during periods of high humidity failed more readily when subjected to low temperatures than did panels which were permitted to dry out at room temperature before testing. It was, therefore, decided to expose all panels to saturated atmosphere at 150° F. for 15 hours before subjecting them to a low temperature. After a large number of check tests in which the refrigerator temperature was varied from —10° F. to —40° F., it was found that the lowest temperature tested gave cold cracking results which were most nearly comparable to those obtained in the trade.

In order to be sure that the panels, when cold, were subjected to the various treatments likely to be met in service, tests were made under the following conditions: (1) cold without flexion; (2) flexion without permanent bending, and (3) permanent bending over a mandrel. In testing specialty finishes for use in particular fields, the actual service conditions will determine which of these treatments should be used in the laboratory test. Thus, the cold cracking test for evaluating finishing systems on which exposure panels are available consist of the following:

(1) Subject panels to a saturated atmsophere at 150° F. for 15 hours;

(2) Place panels in refrigerator at —40° F. for 15 hours;

(3) Remove panels from refrigerator and subject to one or more of the following treatments: (a) examine without flexion; (b) flexion without permanent bending; (c) permanent bending over a mandrel.

Freshly painted panels may be evaluated as regards resistance to cold cracking by modifying the test used for exposure panels as follows:

First, by aging the finished panels for one week at room temperature before testing; second, by extending the length of exposure in the saturated atmosphere to 72 hours before placing the finished panels in the refrigerator; third, by requiring that all panels be flexed upon removal from the refrigerator; and fourth, by repeating the humidity and freezing cycles a second time before considering the test completed. If the finished panels show any signs of cracking or peeling on the completion of this test, the finish should be considered unsatisfactory for use under severe climatic conditions.

*From a paper which was presented by Dr. E. A. Fluevog, Research Chemist, Fabrics and Finishes Department, E. I. Du Pont de Nemours & Co., Wilmington, Del., at the recent Midwest Regional Meeting of the Paint & Varnish Division of the American Chemical Society.

Treatment of Galvanized Sheets for Painting

By J. L. SCHUELER

Superintendent, Steel and Wire Division, Continental Steel Corporation, Kokomo, Ind.

Methods for Preparing Zinc-Coated (Galvanized) Sheet Surfaces to Hold Paint, Varnish, Lacquers, Enamel and Similar Coatings.*

THE primary function of the zinc coating is to seal the steel sheet from air and moisture with a layer of highly impervious material which, itself, is sufficiently resistant to corrosion to have a reasonably long life. A secondary purpose of the zinc coating is to divert corrosion from the steel by electrochemical action. Other things being equal, a **thick** coating of zinc will protect the steel for a longer period of time than will a **thin** coating. However, heavy zinc coatings on sheets are usually brittle and cannot be used where severe fabrication is involved.

Paint, enamel or lacquer is used on the galvanized surface either for decorative purposes, or to retard the action of those elements which tend to promote corrosion.

Although steel, itself, in many localities does not long resist the effects of atmospheric corrosion, yet no other economically available metal affords the necessary physical properties such as strength, rigidity and workability. On the other hand, zinc is probably the best of the economically available coating metals for steel, which afford resistance towards atmospheric corrosion conditions. Zinc, however, lacks the desirable physical properties possessed by steel. Hence, with steel to furnish the necessary physical properties and an adequate protective coating of zinc to furnish resistance to corrosion, a galvanized steel sheet has the best qualities of both.

Galvanized sheet surfaces present two types, first, the ordinary smooth greasy-feeling spangled sheet, and, second, the grainy, matte-surfaced, non-spangled galvannealed sheet. The greasy feel of the spangled sheet is not due to grease, because in the manufacture of the galvanized sheet no oil, grease, soap, or similar material, normally comes in contact with it.

Galvanized sheets are used to fabricate products for indoor or outdoor use. Galvanized sheets may be further classified into those used for manufacturing purposes and those used for building construction. By far, the greatest number of sheets is used for the latter purpose.

The painting, enameling or lacquering of galvanized sheets may be considered as falling into three classes; first, for decorative purposes and indoor use only; second, for outdoor exposure; third, combinations of the first two.

We know from experience that paints and the like will not adhere to spangled galvanized sheets, unless the surface has been prepared for the purpose either artificially or by aging. The galvannealed sheet, on the other hand, having a matte surface needs no preparation, **per se**, for painting. However, any galvanized surface before painting should be free from grease, oil, or foreign material and should be dry. Even then, the spangled galvanized surface must have been further prepared by an etching treatment, which may be either chemical or mechanical. In the chemical class fall the displacement agents, such as the copper or antimony salts; the acids, such as hydrochloric and acetic; aging or weathering action, involving both chemical and mechanical etching, and, in fact, any solution which will dissolve zinc. In the second class may be considered, scouring, abrasives and sand blasting. The object of all etching treatments is to produce a matte-like surface to act as a key, or bond, for the paint.

One of the oldest of the treatments for etching galvanized surfaces involves the use of antimony chloride dissolved in gasoline, turpentine or some other non-acid solvent.

For use, the antimony chloride solution is swabbed over the sheet and allowed to remain until dry. The blackened sheet is then washed thoroughly and allowed to dry. The paint is then applied.

A method recommended by the A. R. E. A. is to wash the sheet with a solution made up of one pound of sal soda dissolved in three gallons of water. The sheet is allowed to dry for twenty-four hours before applying the paint.

Copper salts also form the basis for solutions to be used for etching zinc surfaces. Copper acetate, copper chloride, copper nitrate and copper sulfate are all used for this purpose. From four ounces up to one pound per gallon of water, of any of these salts is recommended by various users. One formula recommends the use of a solution made up of one pound of copper sulfate crystals dissolved in a gallon of water. Upon drying, the surface is thoroughly washed with water to remove the black deposit. This is continued until a white cloth rubbed over the surface, shows no black smudge.

Acetic acid (vinegar) is also used as an etching medium. The surface to be treated is swabbed with a weak solution of either vinegar or acetic acid. This is followed by a thorough washing with water and then allowing the sheet to dry before applying the paint.

Many formulas recommend the use of hydrochloric acid. This is a dangerous material to use on a zinc coating. Its action is violent and not always uniform and, in the hands of an unskilled operator, may cause untold damage to the zinc surface. However, when used in a weak solution it is probably no worse than any other acidic chemical etching medium. Acids may dissolve the coating in spots and attack the steel base, whereas copper or antimony salt solutions act

*Address delivered at 18th Annual Meeting, American Zinc Institute, Inc., St. Louis, Missouri, April 21, 1936.

on the zinc coating only. Two formulas involving the use of hydrochloric acid are:

1.[1] Dissolve 12 ounces copper chloride, 12 ounces copper nitrate and 12 ounces sal ammoniac, in 4½ gallons of water; then add 12 ounces by weight of hydrochloric (muriatic) acid.

2.[2] 60 parts by volume denatured alcohol
30 parts by volume toluol
5 parts by volume tetrachloride or ethylene dichloride
5 parts by volume hydrochloric (muriatic) acid.

Since all of these solutions must remove some zinc in order to etch the surface, they should be used carefully and with caution. If the sheet is not thoroughly washed following the application of these etching solutions some of the material may remain on the zinc surface and later cause the paint to lift off. This is especially true of acidic etchants, even though they be neutralized by the zinc. This comes from the fact that a break in the paint coating allows moisture to enter, and when an electro-chemical action is set up hydrogen gas may form under the paint film and lift the paint from the sheet.

Scouring with fine mesh abrasives, steel wool, or even weak sand blasting, is much more preferable for the preparation of galvanized surfaces for painting, than the chemical methods used, because there is no danger of an "after" action. Here too, the sheet should be thoroughly washed and dried before painting to get the best paint adherence, because scouring, or sand blasting, leaves on the zinc surface unadherent particles of finely divided material.

Sheets intended for outdoor exposure should not be painted when erected, unless it is absolutely necessary. It is better to allow these sheets to "weather" until they have become etched, or or least until the surface no longer has the greasy smooth feel. This will take up to a year or more from the time of erection depending on the location. For heavily coated sheets, say a two ounce coating on a 28 gauge sheet (Seal of Quality type) the sheet may be exposed several years before painting. "Weathering" involves both chemical and mechanical etching, in that the galvanized surface exposed to the atmosphere is first oxidized, or carbonated, and these films being cyclicly removed by rain and wind, causes the surface of the zinc to become roughened.

Galvannealed sheets, as was mentioned before, have the "etched" surface as an inherent part of their manufacture. Consequently, before applying paint, enamel, varnish, lacquer and the like, all that is usually necessary for preliminary surface preparation is to remove grease, oil, finger marks or foreign material.

Many solutions are available for this purpose and may be used either on galvanized, or galvannealed, sheets. The basis for these materials may be alcohol; gasoline; carbon tetrachloride; soaps; sodium carbonate, hydroxide or metasilicate; borax; trisodium phosphate; and many others. High pressure steam is also used in some cases. Sometimes the cleaning and etching agents are used together as is illustrated by the antimony chloride-gasoline solution, or the alcohol-toluol, etc. solution mentioned previously.

In closing, we just want to repeat certain precautions to be observed in the preparation of galvanized surfaces for painting:

1. Wherever possible allow the sheet to age or "weather" before applying the paint.
2. If you can't do that, then use mechanical etching.
3. If you have to use a chemical etchant, then be very careful that its action is not too strong. Avoid the use of acids, since it is not necessary that acids be used. A neutral solution of copper sulfate, or antimony chloride is better than an acid solution and just as effective.
4. Be sure the zinc surface is clean and free from foreign material before applying the paint. If the sheet has rusted, clean off the loose rust by brushing, before applying the paint.
5. Do not expect paint to adhere to a wet or moist zinc surface.

[1] Private communication ffrom G. F. Welker—The Glidden Co.
[2] Private communication from E. W. McMullen—The Eagle-Picher Lead Co. and J. A. Frederickson—J. A. Masury & Son.

Cleaning Before Re-Tinning

Q.—Kindly inform me if there is another process used for taking rust off milk and in cream cans before the can is retinned (in other words, cleaning the rust off) besides acid. We use muriatic acid, cold bath and have trouble cleaning the cans.

A.—So far as we know there is no other better way of removing rust from re-tinned milk cans than with muriatic acid. It is stated that the present method used is with muriatic acid, cold. Perhaps slightly warming the acid and increasing the strength will give the desired results.

The most satisfactory method, of course, has been to take the can apart and to pickle each part separately until absolutely clean. In many cases, however, the cost of doing it by this method is not warranted by the amount received, and then of course, the cans are pickled assembled.

A satisfactory cleaning should be obtained with the use of muriatic acid. The first thing tried, should be to increase the strength of the muriatic solution used. If this still does not give the desired result, then warm it very slightly to aid the action upon the rust.—**Wallace Imhoff.**

Refining Cadmium

Q.—We have on hand some pig cadmium which is polluted with iron to the extent of approximately 3 per cent. We will appreciate your giving us a method for removing this impurity.

A.—Whether it will be economical or not to refine the cadmium depends on the quantity available for treatment. One way to handle material of this type would be to redistill the cadmium, the condensed vapor, of course, being pure metal. The type of equipment necessary for distillation is practically the same as that used for zinc.

Another method to eliminate the iron would be by chemical means, taking the cadmium into solution as a sulphate, precipitating the iron and filtering. The cadmium can then be electrolyzed and pure cadmium produced in this way. The whole thing though depends on economics and it would not pay unless the quantity avilable were quite large and also produced steadily.—**S. M. Frankel.**

American Foundrymen's Association Convention in Detroit

By H. M. ST. JOHN
Associate Editor

Large Registration. Active and Well Attended Technical Sessions. Exhibit Covered 70,000 Square Feet.

THE 40th annual convention of the American Foundrymen's Association, held in Detroit, May 4th to 9th, was one of the largest and most successful ever staged by that organization, with a total registration in the neighborhood of 5,000. In the accompanying exhibit, 70,000 sq. ft. of floor space was occupied by 220 manufacturers and distributors of foundry equipment and supplies, all of whom reported many visitors and active interest. Attendance at the technical sessions was unusually good. Each of the non-ferrous meetings attracted 200 or more, while the usual accommodations for the Round Table proved entirely inadequate to care for the crowd.

At the opening meeting in Convention Hall, addresses of welcome to Detroit were given by the **Honorable John W. Smith,** president of the City Council, and by **Harvey Campbell** of the **Detroit Board of Commerce.** These were followed by the annual presidential address, delivered by **President D. M. Avey. Mr. Avey** read extracts of letters received from a number of foundry owners and executives and countered the rather pessimistic tone of these by suggesting that the future of the foundry industry is in the hands of its leaders. Responsibility for putting the foundry house in order rests with the foundrymen themselves and need not become a function of government unless this responsibility is neglected.

At the annual business meeting held on Thursday, May 7th, the following officers and directors were elected:

President: James L. Wick, Jr., President and General Manager of the Falcon Bronze Co., Youngstown, Ohio.

Vice-President: Hyman Bornstein, Director of the Testing and Research Laboratories, Deere & Co., Moline, Ill.

Director: Dan M. Avey, Retiring President of the A.F.A., Editor of "The Foundry," Cleveland, Ohio.

Director: Carl C. Gibbs, President of the National Malleable & Steel Castings Co., Cleveland, Ohio.

Director: James R. Allan, Assistant Manager of the Industrial Engineering and Construction Dept., International Harvester Co., Chicago, Ill.

Director: Marshall Post, Vice-President of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Penna.

Director: Lester N. Shannon, Vice-President of the Stockham Pipe Fittings Co., Birmingham, Ala.

At the annual banquet Thursday evening the **Joseph S. Seaman Gold Medal** was awarded to **Dr. Heinrich Ries,** the **J. H. Whiting Gold Medal** to **David McLain. Frank J. Lanahan,** Chairman of the Board of Awards, made the presentation. Another high point of the banquet was an address by **W. J. Cameron,** well-known radio commentator of the **Ford Motor Company,** an address which was broadcast over a nation-wide network of the Columbia Broadcasting System.

On Tuesday evening was held a stag dinner and smoker, jointly sponsored by the **Foundry Equipment Manufacturers Association,** the **American Foundrymen's Association,** and the **Detroit Chapter of the A.F.A.**

Attendance at both of these functions taxed the facilities which had been provided. Special arrangements for the ladies' entertainment continued throughout the week.

Non-Ferrous Division Activities

At the annual meeting of the **Non-Ferrous Division** of the A.F.A., **H. M. St. John** of the **Detroit Lubricator Company** was elected Chairman of the Division, **Harold J. Roast** of the **Canadian Bronze Company,** Montreal, Vice-Chairman, for the coming year.

Two technical sessions were held by the Non-Ferrous Division, one presided over by **Jerome Strauss,** Chairman of the Division, assisted by **J. W. Bolton,** the other under the chairmanship of **H. M. St. John,** assisted by **T. E. Kihlgren. T. C. Watts** was chairman of the **Non-Ferrous Luncheon** and **Round Table Discussion,** assisted by **H. J. Rowe** and **Harold J. Roast.** As usual this discussion was informal and covered a wide variety of foundry subjects.

Abstracts of Technical Papers

MANGANESE BRONZE—A CORRELATED ABSTRACT

F. R. Hensel, P. R. Mallory & Co., Inc., Indianapolis, Ind.

Manganese bronze is essentially a 60-40 brass to which various small percentages of tin, lead, iron, aluminum, or manganese have been added. It does not necessarily contain any manganese, but some or all of the elements mentioned are added to the brass to produce a desired combination of high strength and corrosion resistance. The author discusses melting

practice, which is so frequently faulty as to be responsible for 50 per cent of the trouble experienced with this alloy. The influence of impurities and the importance of correct moulding materials are emphasized. The paper is too long to be briefly abstracted, particularly in view of the extensive and rather contradictory discussion which it evoked. Unfortunately the author was not present and much of the discussion was rather inconclusive.

SAND CASTINGS OF COPPER-SILICON ALLOYS

H. A. Bedworth and V. P. Weaver, American Brass Co., Waterbury, Conn.

These castings commonly contain 95 per cent copper, 4 per cent silicon, 1 per cent manganese. They are made in brass foundries, using standard equipment and methods. The alloy has physical properties superior to the tin bronzes and is very resistant to many forms of corrosion. It can be welded or soldered. The metal may be melted in any usual type of brass-foundry furnace and should be poured, without turbulence, at the lowest possible temperature. The castings are readily machinable, with high-speed steel tools and a good lubricant. Machining properties can be improved and the metal toughened by annealing at 1300 to 1350° F. and quenching.

PRODUCTION OF ALUMINUM BRONZE CASTINGS TO WITHSTAND HIGH PRESSURE

M. T. Ganzauge, Goulds Pumps, Inc. Seneca Falls, N. Y.

This paper describes in detail the foundry practice used in the production of seven types of aluminum bronze castings. Ingot metal is used. Chips are sold because of the scrap resulting when they are used in the foundry melt. Pouring temperatures should be low but the permissible range is greater than with phosphor bronze. The metal must be poured without turbulence. With large castings excellent results have been obtained by filling the mould with carbon-dioxide gas, displacing the air, just before pouring.

FOUNDING OF ALUMINUM BRONZE

J. E. Crown, U. S. Naval Gun Factory, Washington, D. C.

The composition used is 88 per cent copper, 9 per cent aluminum, 3 per cent iron, melted in natural-draft crucible furnaces. The metal should be alloyed and cast into ingot before use. Shrink heads are commonly necessary and gating must be such as to insure quiet flow. Chills are used to control shrinkage and also to localize the presence of dross at the chilled surface. The statement that the chill attracts the dross was sharply questioned in the discussion.

Exhibitors at the Foundrymen's Convention

Abrasive Co., Division of Simonds Saw and Steel Company, 5500 Tacony St., Philadelphia, Pa. Borolon polishing grain.

Air Reduction Sales Co., 60 E. 42nd St., New York. Arc gas welding and cutting supplies.

Ajax Electric Furnace Corp., 1108 Frankford Ave., Philadelphia, Pa. Ajax-Wyatt induction melting furnaces.

Ajax Electrothermic Corp., Trenton, N. J. Coreless induction furnace.

Ajax Metal Co., 46 Richmond St., Philadelphia. Non-ferrous ingots.

Albany Sand and Supply Co., Albany, N. Y. Foundry sands.

Alpha-Lux Co., Inc., 192 Front St., New York. Luxit refractory; "Speedy" moisture tester.

American Air Filter Co., Louisville, Ky. Dust control equipment for foundries.

American Crucible Co., Shelton, Conn. "Black Cross" crucibles.

American Foundry Equipment Co., 408 Byrkit Street, Mishawaka, Ind. Wheelabrator; cleaning and preparation of metal parts for finishing; general line of foundry equipment.

American Foundrymen's Assn., 222 W. Adams Street, Chicago. Cast Metals Handbook, a handbook of cast engineering materials.

American Gum Products, Co., 230 Park Ave., New York. Goulac core binder.

Arcade Manufacturing Co., Freeport, Ill. Molding machines.

Armstrong-Blum Mfg. Co., 333 N. Francisco Ave., Chicago. Hack-sawing machines; saws, etc.

Automatic Transportation Co., 53 W. 87th St., Chicago. Industrial trucks, tractors and cranes.

Ayers Mineral Co., Zanesville, Ohio. Molding sands, core sand, silica flour.

C. O. Bartlett and Snow Co., 6250 Harvard Ave., Cleveland. Dust collectors; car type mold conveyor.

H. L. Baumgardner Mfg. Corp., Fremont, Ohio. Magnesium flasks, pattern plates and castings; cast iron and aluminum jackets.

Beardsley & Piper Co., 2541 N. Keeler Avenue, Chicago. Sand handling; molding and shake-out equipment.

Blaw-Knox Co., Farmers Bk. Bldg., Pittsburgh. Dust control systems, clamshell buckets, floor armoring, steel grating and treads.

Boyer-Campbell Co., Detroit. Complete line of safety equipment.

Bradley Washfountain Co., 2203 Michigan St., Milwaukee. Washfountains, group showers, and drinking fountains.

Brown Shoe Co., 1600 Washington Ave., St. Louis. Safety shoes.

Campbell-Hausfeld Co., Harrison, Ohio. Crucible furnaces; complete units for gas or oil fuel, stationary and tilting types for any desired capacity.

Carborundum Co., Abrasive Division, Niagara Falls, N. Y. Foundry grinding wheels and various refractory products.

Certified Core Oil & Mfg. Co., 1104 S. Cicero Ave., Chicago. Core oils for every requirement.

Chain Belt Co., 1644 W. Bruce St., Milwaukee. Conveyors and complete foundry sand and castings handling equipment.

Champion Foundry & Machine Co., 3018 W. 21st Place, Chicago. Molding machines, ladles, cleaning room equipment.

Chicago Mfg. and Distributing Co., 1928 W. 46th St., Chicago. Foundry specialties such as core trucks, bag holder trucks, etc.

Clark Tructractor Co., Battle Creek, Mich. Industrial trucks.

Clearfield Machine Co., Clearfield, Pa. Sand mixer.

Cleveland Flux Company, 1026 Main St., N. W., Cleveland. Cleaners for brass; fluxes, etc.

Cleveland Quarries Co., Builders Exchange Bldg., Cleveland. Refractories.

L. A. Cohn & Bro., Inc., 5429-39 Roosevelt Road, Chicago. Ingot metals.

Combined Supply & Equipment Co., Inc., 766 Grant St., Buffalo. Chaplets; pattern plates.

Corn Products Sales Co., 17 Battery Place, New York. Bonds for green sand and dry sand; dextrines.

William Demmler and Bros., Kewanee, Ill. Core blowing machines.

Detroit Electric Furnace Co., 825 W. Elizabeth St., Detroit. Indirect arc electric metal melting furnaces.

Detroit Hoist and Machine Co., Clay Ave. & G. T. R. R., Detroit. Electric and pneumatic hoists and cranes.

Detroit Testing Machine Co., Detroit. Foundry testing equipment.

Harry W. Dietert Co., Detroit. Sand, core and mold testing equipment; core making machines.

Dings Magnetic Separator Co., 600 Smith St., Milwaukee. High intensity magnetic equipment.

Joseph Dixon Crucible Co., Jersey City, N. J. Graphite crucibles and graphite refractories; graphite stoppers and nozzles; graphite cup grease.

C. H. Dockson Co., 2885 Grand Blvd., Detroit. Dowmetal goggle.

Eastern Clay Products, Inc., Eifort, Ohio. Bonds; base sands for the production of synthetic molding sands; fire clay.

Economy Tool and Machine Co., Muskegon Heights, Mich. Wire forming machines; automatic air hose couplings.

Thomas A. Edison, Inc., West Orange, N. J. Storage batteries for power.

Electro-Chemical Pattern and Mfg. Co., 3975 Beaufait Ave., Detroit. Copper patterns by electrodeposition.

Electro Refractories and Alloys Corp., Andrews Bldg., Buffalo. Crucible, bricks and cements. Special alloys in ingot or shot form.

Even-Cut Abrasive Band & Equipment Corp., 8212 Carnegie Ave., Cleveland. Abrasive bands and wheels.

Federal Foundry Supply Co., 4600 E. 71 St., Cleveland, Ohio. Foundry supplies, sand testing equipment, sifters, green bonding.

Federated Metals Corp., 120 Broadway, New York. Non-ferrous ingots.

Foundry Equipment Co., 1837 Columbus Rd., Cleveland. Core and mold ovens; industrial ovens.

Foundry Supplies Mfg. Co., 2221 Orchard St., Chicago. Riddles, vibrators, fineness testing machines, screens.

Foxboro Co., Foxboro, Mass. Automatic furnace control.

Fruehauf Trailer Co., 10940 Harper Ave., Detroit. Commercial trailers.

Globe Steel Abrasive Co., Mansfield, Ohio. Metallic abrasives, steel grit and shot.

Great Lakes Foundry Sand Co., 720 United Artists Bldg., Detroit. Sands for molding, cores, blasting, etc., nozzles, refractories.

Great Western Mfg. Co., Leavenworth, Kan. Gyratory foundry riddles.

Grimes Molding Machine Sales, 1429 Virginia Park, Detroit. Sand mixers, core machines, sand riddles.

Grob Brothers, West Allis, Wisc. Briquetting machines; filing machines; open end band saws.

Hutton H. Haley and Associates, 2832 East Grand Boulevard, Detroit. Representatives for various types of foundry equipment.

Hauck Manufacturing Co., 126 10th St., Brooklyn, N. Y. Oil burning equipment; mold dryers; ladle heaters.

Harnischfeger Corp., 4460 W. National Ave., Milwaukee. Arc welding equipment.

Herman Pneumatic Machine Co., Union Bk. Bldg., Pittsburgh. Jarr rollover and pattern drawing machines.

Hill and Griffith Co., 1265 State Ave., Cincinnati. Foundry facings, supplies and equipment; polishing and buffing compositions.

Hines Manufacturing Co., 10104 Detroit Ave., Cleveland. All types of foundry flasks.

Hose Stayput Tool Co., Denver, Colo. Hose clamps and fittings, safety valves.

Illinois Clay Products Co., Joliet, Ill., Fire clay; insulator.

Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago. Indicating pyrometers; distant reading pyrometers; air-velocity meter.

Industrial Equipment Co., Minster, Ohio. Shanks, tongs, ladles.

Industrial Minerals Co., Lancaster, Ohio. Molding sands, steel abrasives; silica sands.

Industrial Silica Corp., Youngstown, Ohio. Molding sands, core sands, silica sands, etc.

International Molding Machine Co., 2616 W. 16th St., Chicago. Molding machines of a wide variety of types.

International Nickel Co., Inc., 67 Wall St., New York. Demonstration of commercial applications of cast nickel alloys including nickel silver, nickel aluminum, nickel bronze, etc.

International Pulp Co., 41 Park Row, New York. "Mouldene" for casting by plaster method.

Jeffrey Manufacturing Co., Columbus, Ohio. Sand conditioner, aerator, core crushers, mold conveyors, etc.

Johnson and Jennings Co., Cleveland. Molding machines, vibrators, etc.

Kindt-Collins Co., 12697 Elmwood Ave., Cleveland. Pattern shop, supplies and equipment.

H. Kramer and Co., 21st and Loomis St., Chicago. Non-ferrous ingots.

Lancaster Iron Works, Inc., Lancaster, Pa. Rapid batch mixer.

Lava Crucible Co. of Pittsburgh, Wabash Bldg., Pittsburgh. Graphite crucibles for brass, iron and aluminum; furnace refractories, bricks, etc.

R. Lavin and Sons, Inc., 3426 S. Kedzie Ave., Chicago. Brass, bronze, aluminum ingots.

E. Leitz, Inc., 60 E. 10th Street, New York. Metal microscopes, photomicrographic equipment.

Link-Belt Co., Nicetown, Philadelphia. Mold conveyor; shake-out screen, dryer.

J. S. McCormick Co., 25th and A. V. R. R., Pittsburgh. Foundry facings; binders.

Macklin Co., Jackson, Mich. Grinding wheels of all types.

Magnetic Manufacturing Co., 620 S. 29th St., Milwaukee. Magnetic separation equipment.

Mathews Conveyor Co., Elwood City, Pa. Foundry conveyors.

Metal Industry, 116 John St., New York. Copies of Metal Industry; Brass Founders' Manual.

Michigan Industrial Sales Co., 4456 Cass Ave., Detroit. Distributors of foundry supplies and separators.

Michigan Smelting and Refining Co., 7885 Jos. Campan Ave., Detroit. Non-ferrous ingots.

Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wisc. Molding machines.

Mine Safety Appliances Co., 230 N. Braddock Ave., Pittsburgh. Respirators; goggles; safety clothing; first aid equipment.

Modern Equipment Co., Port Washington, Wisc. Hot metal handling systems.

Monarch Engineering & Mfg. Co., Curtis Bay, Baltimore. Metal melting furnaces.

Motch and Merryweather Mchy. Co., 2842 W. Grand Blvd., Detroit. Flexible shaft grinding and polishing machines.

Mt. Jewett Fire Clay Co., Mt. Jewett, Pa., Fire clays.

Mullite Refractories Co., Shelton, Conn. High temperature linings and cements; bricks and special shapes.

National Engineering Co., 549 W. Washington Blvd., Chicago. Sand reclamation; sand control and conditioning.

National Foundry Sand Co., Detroit. Sands for molding and sand blasting; silica sands.

Newaygo Engineering Co., Newaygo, Mich. Shakeout sand unit; tempered sand unit; aerator.

New Haven Vibrator Co., Inc., 10 Stiles St., New Haven, Conn. Vibrators, pot rappers, flask rappers and table vibrators; steel fittings; mold and core rappers; testing device for power vibrators; hose clamps; reverse buttress threads for bolts and screws for percussion tools.

New Jersey Silica Sand Co., Millville, N. J. Silica sands.

Niagara Falls Smelting & Refining Corp., 2240 Elmwood Avenue, Buffalo, N. Y. Alloys for foundry needs.

William H. Nicholls Co., Inc., Richmond Hill, L. I. Molding machines; foundry equipment.

Norton Co., Worcester, Mass. Abrasive products; refractories; laboratory ware.

S. Obermayer Co., 2559 W. 18th St., Chicago. Core washes; core wash mixers; core and mold sprayers.

Oilless Core Binder Co., Cleveland. Core binders; mold washes.

Oliver Machinery Co., Grand Rapids, Mich. Pattern shop equipment.

Osborn Manufacturing Co., Hamilton Ave. & Thomas St., Cleveland. Molding machines; core blowers; overhead materials handling systems; brushes for foundry use.

Palmer-Bee Co., Westminster and G. T. R. R., Detroit. Mold conveyors, aerators, idlers, speed reducers.

Pangborn Corp., Hagerstown, Md. Airless rotoblast barrel; tables; cabinet machine for cleaning cylinder blocks, etc., air-blast cleaning units, etc.

Parsons Engineering Corp., 2032 W. 105th St., Cleveland. Dust arresters; blast barrels; tumbling mills.

Peerless Mineral Products Co., Conneaut, Ohio. Bonds, sands for cores, blasting, etc.; steel abrasives; refractories; bricks, etc.

George F. Pettinos, Inc., 1206 Locust St., Philadelphia. Sands, gravel, foundry facings, refractories.

Pittsburgh Crushed Steel Co., P. O. Box 4038, Pittsburgh. Steel abrasives.

Pyro Clay Products Co., Oak Hill, Ohio. Refractories.

Pyrometer Instrument Co., 103 Lafayette St., New York. Optical pyrometers.

Quandt Chemical Co., 374 Guerrero St., San Francisco. Core and mold washes.

Quigley Co., Inc., 56 W. 45th St., New York. Hytempite, high temperature cement.

N. Ransohoff, Inc., West 71st Street, Cincinnati. Tumbling mills; automatic loading and unloading; automatic separation and return.

Ready-Power Co., 3820 Grand River Ave., Detroit. Gasoline engine for foundry.

Reeder Manufacturing Co., St. Louis. Non-chillable chaplet.

Robbins and Myers, Inc., Hoist and Crane Division, Springfield, Ohio. Electric hoists.

Robinson Machine Co., 1237-8th Street, Muskegon, Mich. Automatic air hose couplings for pipe and air hose lines.

Royer Foundry and Machine Co., 158 Pringle St., Kingston, Pa. Sand separator and blender; scrap remover.

Ruemelin Mfg. Co., 1571 S. 1st St., Milwaukee. Dust filters; blast cleaning machine; compressed air dryer.

Safety Equipment Service Co., 1228 St. Clair St., Cleveland. Safety equipment, clothing, etc.

Safety First Shoe Co., Holliston, Mass. Foundry shoes.

Sand Products Corporation, Detroit. Sands.

Claude B. Schneible Co., 3951 Lawrence Ave., Chicago. Multi-wash dust collectors.

Schramm, Inc., West Chester, Pa. Air compressor.

F. E. Schundler & Co., Inc., 15-45 Vernon Blvd., L. I. C., N. Y. Bonding agent, cements, insulating blocks, insulators, etc.

Scully-Jones Co., 1901 S. Rockwell St., Chicago. Foundry equipment; high production tools.

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y. Hoisting equipment.

Simplicity Engineering Co., Durand, Mich. Shakeout; portable screening unit.

W. W. Sly Manufacturing Co., 4701 Train Ave., Cleveland. Cleaning room equipment; dust control equipment; metal abrasives; accessories.

Smith Facing and Supply Co., 1857 Carter Rd., Cleveland. Foundry facings.

Smith Oil and Refining Co., Industrial Oils Division, Rockford, Ill. Core oils.

Werner G. Smith Co., 2191 W. 10th St., Cleveland. Core oils

S P O Inc., E. 61st and Waterman Ave., Cleveland. Molding machines and vibrators.

Standard Conveyor Co., North St. Paul, Minn. Roller conveyors for carrying flasks and castings.

Standard Safety Equipment Co., Akron, Ohio. Safety equipment, clothes, etc.

Standard Sand and Machine Co., 549 W. Washington Blvd., Chicago. Sand mixers, screens and elevating equipment.

Steelblast Abrasives Co., 6538 Carnegie Ave., Cleveland. Abrasive shot and grit.

Steel City Testing Laboratory, 8843 Livernois Ave., Detroit, Mich. Testing machines for tensile strength, hardness, etc.

Steel Shot and Grit Co., 39 Warren Bridge, Boston. Steel abrasives.

Sterling Grinding Wheel Co., Tiffin, Ohio. Resinoid and vitrified wheels.

Sterling **Wheelbarrow Co.**, 7036 W. Walker St., Milwaukee. Foundry flasks and specialties.

Frederic B. Stevens, Inc., 515 Third St., Detroit. "Everything for a foundry."

Stonehouse Signs, Inc., Denver, Colo. Standard accident prevention signs.

N. A. Strand and Co., 5001 N. Lincoln St., Chicago. Flexible shaft machines.

Swan-Finch Oil Corp., 205 E. 42nd St., New York. Core oils.

Tabor **Manufacturing Co.**, 6225 Tacony St., Philadelphia. Molding machines; foundry equipment; abrasive cutoff machines.

Tamms Silica Co., Foundry Division, 228 N. La Salle St., Chicago, Ill. Pattern compound.

Warner R. Thompson Co., W. Grand Boulevard at Hamilton, Detroit. Sands, clays, refractories, etc.

Titanium Alloy Mfg. Co., Niagara Falls, N. Y. Aluminum castings, containing titanium.

Truscon Steel Company, Pressed Steel Division, 6100 Truscon Ave., Cleveland. Foundry flasks, core plates, platforms, boxes.

W. S. Tyler Co., 3621 Superior Ave., Cleveland. Vibrating screens; sieve shakers; rotary dryers.

Union Carbide Co., 30 E. 42nd St., New York. Acetylene generators; welding and cutting.

United Compound Co., 228 Elk St., Buffalo, N. Y. Vent wax.

United States Electrical Tool Co., 2482 W. 6th St., Cincinnati. Bench and floor grinders; sanders; portable surface grinders; electric drills, etc.

United States Graphite Co., Saginaw, Mich. Mexican graphite products; Plumbago and core wash, etc.

U. S. Hoffman Machinery Corp., Air Appliance Division, 105 Fourth Ave., New York. Heavy duty vacuum cleaning for foundries.

United States Reduction Co., East Chicago, Ind. Aluminum ingots.

Vesuvius Crucible Co., Swissvale, Pa. Crucibles for all types of melting.

Whitehead Brothers Co., 537 W. 27th St., N. Y. Foundry sands and supplies.

E. J. Woodison Co., 7415 St. Aubin Ave., Detroit. Core machines; core paste; core compounds; parting; core wash; Plumbago.

Yale and Towne Mfg. Co., 4531 Tacony St., Philadelphia. Industrial trucks, tractors; trailers, hoists.

Young Brothers Co., Mack Ave. & M. C. Belt, Detroit. Ovens; core heat treating; heaters, etc.

Zanesville Sand Co., Zanesville, Ohio. Sands for molding; steel abrasives; silica sands; fire clay.

Recovering Silver

Q.—We would like to have some information on recovering silver from hypo bath that we receive from photographers and like places. What we want to do is find out if the electro process would be cheaper and quicker than the chemical process. We would like to handle this in large quantities.

A.—These solutions are being handled in two or three different ways. Sometimes the photographer adds a substance that will precipitate the silver, and himself syphons off the exhausted solution and throws it away; sometimes the refiner does this for him; sometimes the refiner buys the untreated solutions. Since the amount of silver is always small, the process is not apt to pay unless large quantities are handled at a time. Profits will be affected by the price of silver, the price of materials and labor used in refining, and the success with which all the silver is removed from the solutions.

Sodium sulphide is the substance that is most commonly used to precipitate the silver. The resulting silver sulphide (a heavy black powder) is allowed to settle, then is washed, dried, and finally melted in a big furnace with a flux. A button of metallic silver is obtained; it cannot be expected to be of high purity, and should be sold or repurified.

Zinc is another substance that will precipitate silver from hypo solutions. Granulated zinc, or zinc sheets, or zinc turnings, are being used; sometimes it is suspended in the solution in a bag, or a perforated basket, or thin sheets may be hung on wires. The zinc slowly reacts with the solution, and metallic silver deposits out in the form of a coarse powder, called cement silver. Sometimes the process is hastened by the addition of a little sulphuric acid. The cement silver is washed, dried, and melted into a button, which is then ready for ultimate purification.

This zinc method is probably the one you refer to as the "electro" process, since the action involved is essentially electro-chemical. This process has the advantage of yielding metallic silver, instead of silver sulphide. However, it is slower, and for that reason may occasion losses because a worker may become impatient and discard his solution before the zinc has had time to throw down all the value.

When comparing the costs of the two methods, consider (1) the relative costs of sodium sulphide and zinc, and (2) the relative costs of converting silver sulphide and cement silver into silver buttons.—**Jewelry Metallurgist.**

Standards for Brass Fittings for Tubes

A subcommittee of experts has been named by the Sectional Committee on Minimum Requirements for Standardization of Plumbing Equipment (A40) of the American Standards Association, 29 West 39th Street, New York, to work out the details of the American Standard on Brass Fittings for Copper Tubes. The members of the subcommittee are:

Fred L. Riggin, Mueller Brass Company, Port Huron, Mich., Chairman.

Edward S. Cornell, Jr., American Radiator and Standard Sanitary Corporation, 40 W. 40th St., New York, Secretary.

Walter S. L. Cleverdon, New York University, University Heights, New York.

John S. Coe, Chase Brass and Copper Company, Waterbury, Conn.

E. A. Frederickson, Crane Company, 836 So. Michigan Ave., Chicago, Ill.

George W. Martin, U. S. Realty and Improvement Company, 111 Broadway, N. Y.

Ross Martin, Northern Indiana Brass Company, Elkhart, Ind.

Frank E. McCabe, the Grabler Mfg. Company, 6565 Broadway, S. E., Cleveland, Ohio.

Jere L. Murphy, Contracting Plumber, 321-6th Ave., New York.

Testing Plated Products for Quality

By SAM TOUR

Vice-President, Lucius Pitkin, Inc.,
Consulting Metallurgists, New York

A Method of Testing and Regulating the Plate on Manufactured Products, Developed for the Commercial Electroplater.

"MEASURED-Quality-Products Testing" approved by the Masters Electro-Plating Association of New York, was developed to assist the commercial electroplater in producing work of a known and definite quality, and to assist the consumer of electroplated articles in getting finished articles conforming to desired specifications.

Information regarding the efficiency and the throwing power of the plating solutions and the thickness, adherence and porosity of the deposits are obtained from a cupped disc plated along with the regular routine commercial plating.

To illustrate the superiority of a quality plated article over a shoddily plated article, a series of comparative tests were performed. The various tests included exposure to salt spray, ferroxyl tests for porosity, bend tests for adherence, and metallographic study to determine the throwing power of the plating solution and the thickness of the deposits. All of these tests, with the exception of exposure to salt spray, are included in the regular tests performed in "Measured-Quality-Products Testing."

The tests, as are all "Measured-Quality-Products Inspections," were performed on stamped low carbon steel discs 2¼" in diameter with a perpendicular cup 1" in diameter and 1" in depth in the center.

The ferroxyl tests for porosity are made on the flat face of the disc by pressing in intimate contact with the surface of the disc a sheet of moistened ferroxyl paper. After several minutes of contact, the paper is removed. Porosity in the electroplate is indicated by dark blue spots on the paper. If no more than one spot is detected by this test, the electroplate is classed as good; if from two to five spots appear, a classification of fair is given the electroplate; a poor electroplate is one having more than five spots.

The adherence of the deposits to the steel, and the ductility of the deposits are next determined by bending one side of the disc until the inside surface of the flat portion is in contact with the outside surface of the cup. The adhering quality of the electroplate is judged from the behavior of the plate in bending and the condition of the plate at the completion of the bend. The thickness of the electro-deposits found upon subsequent metallographic examination are taken into consideration in judging adherence as shown by this bend test.

Metallographic examination is made on a "pie cut" section, cut from the opposite side of the disc, and includes more than one-half of the entire transverse section of the disc. The thickness of the electro-deposits is determined by measuring the thickness of the electroplates on the flat surface of the disc, upon which the ferroxyl test was conducted. The throwing power of the plating solution is determined from the amount of metal deposited on the inner walls of the cup and the base of the cup.

Procedure

Eight discs labeled 1 to 8 inclusive were plated. Four of the discs, 1, 2, 3 and 5, were given what the electroplater considered to be a good quality chromium finish. Four other discs, 4, 6, 7 and 8, were given a "shoddy" plate such as is so often found on cheap articles sold to the public.

As polished and buffed, both the quality and the shoddy plated discs possessed a bright surface and appeared identical in all respects.

Discs 2 and 6 were exposed to a salt spray for a total period of 48 hours. The specimens were inspected at intervals and the condition of the surfaces carefully observed.

Ferroxyl and bending tests and metallographic studies were made on discs 1 and 7. Discs 3 and 8 were exposed to the typical atmosphere of the chemical laboratory.

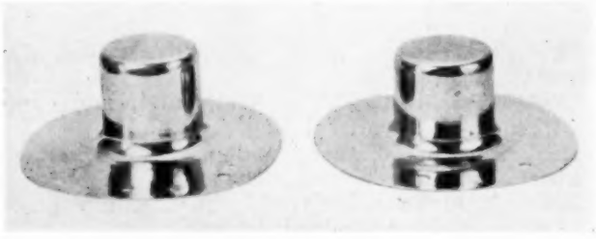


Fig. 1. Plate 167L. Two Specimens, Immediately After Plating and Polishing; One Good, One Poor Plate

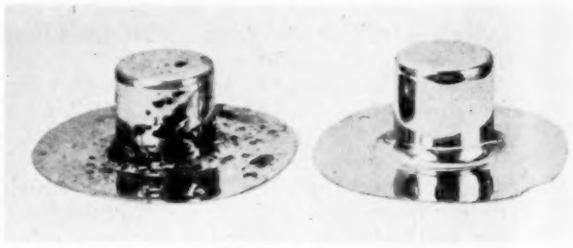


Fig. 2. Plate 168L. Same Specimens as Fig. 1 After 48 Hours Salt Spray

Salt Spray Tests

Fig. No. 1, Plate No. 167L: A photograph of specimens 4 and 5, as plated and polished. The appearance of each is identical, yet No. 4 (to the left in the photograph) is the "shoddily" plated disc.

Fig. No. 2, Plate No. 168L: A similar photograph of the condition of discs 2 and 6 after 48 continuous hours of exposure to a 20% salt spray. The surface of disc No. 2 (to the right) appears highly polished and free of rust spots, while disc No. 6 (to the left) is badly corroded and rusted; a complete failure from both a commercial and practical viewpoint. First appearance of rust appeared on the inferior plated disc after 12 hours of exposure, and increased drastically as the exposure was continued.

Porosity

Ferroxyl tests were made on discs No. 1 and No. 7. No evidence of porosity was found on disc No. 1, the quality plated article, as shown by Fig. 3, Plate No. 1262, a photograph of the ferroxyl paper from this disc. The dark spot at the top is the portion of the paper in contact with the hole drilled in the disc for suspension in the plating solution.

According to the "Measured-Quality-Products" scale of classification, disc No. 7 is very poor, as shown by the numerous dark spots some larger than 1/16" in diameter in Fig. 4, Plate No. 1263, a photograph of the ferroxyl paper from this disc.

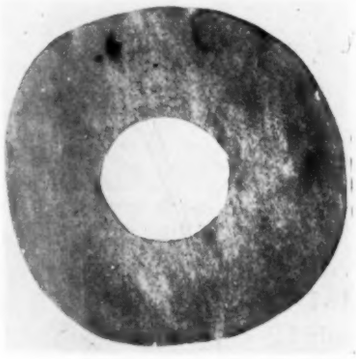


Fig. 3. Plate 1262. Ferroxyl Porosity Test on Good Plate

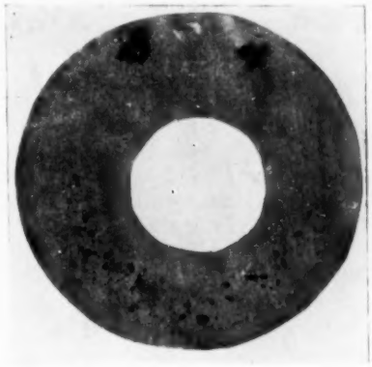


Fig. 4. Plate 1263. Ferroxyl Porosity Test on Poor Plate

Adherence of Plate

In spite of the greater total thickness of the electroplates on disc No. 1, than on disc No. 7, as found from the metallographic study, the degree of adherence and the ductility of the electroplates were found to be practically the same, in both cases very good. The electroplates showed only very slight cracks after the severe bend, with no evidence of a lifting or peeling from the steel base metal.

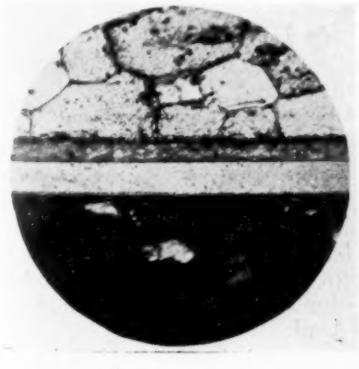


Fig. 5. Plate 1257. Copper-Nickel-Chromium Good Plate

Plate Thickness

A study of the sections under the microscope revealed that specimen No. 1, the good plate, consisted of chromium on nickel on copper on steel; while the poorer plated specimen No. 7 consisted of a barely discernible chromium on nickel on a flash of copper. The thickness of the respective plates were as follows:

	Copper	Nickel	Chromium
No. 1—"Quality"	.00033"	.00049"	.0000375"
No. 7—"Shoddy"	Flash	.00022"	less than .00001"

Fig. 5. **Plate No. 1257,** a micrograph at 500 diameters shows the three electroplates on the low carbon steel base, No. 1. In etching to differentiate more distinctly the respective plates, the steel has been overetched.

Fig. 6. **Plate No. 1258:** A micrograph at 500 diameters shows the condition of the electroplates on disc No. 7, the shoddy plated disc. The copper plate adjacent to the steel and the final chromium plate on the nickel are both too thin to be discernible at this magnification.

Throwing Power

Chromium of sufficient thickness to be visible at a magnification of 500 diameters was present on the inside wall of the cup of specimen No. 1, the "quality" plated disc, to a point .430" down from the flat surface. The nickel deposit at the base was very thin, while a copper deposit of .00015" in thickness covered the bottom of the cup.

A study through the cup of disc No. 7 showed only a very thin deposit of nickel at the base of the cup. The chromium on the surface of the disc was barely discernible being definitely less than .00001" in thickness, which is discernible at a magnification of 500 diameters. No chromium could be discerned on the inside walls of the cup at a depth of .1".

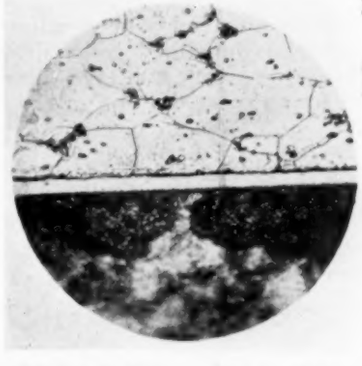


Fig. 6. Plate 1258. Copper-Nickel-Chromium Poor Plate

Discussion

A discussion of the relative qualities of the two discs is hardly necessary. So evident have been the results of the various comparable investigations.

Although the surface appearance of two finished electroplated parts appear identical in all respects, a drastic difference in the relative qualities may easily exist.

The purchaser of electroplate can only be assured of "quality" if he buys on "quality" and not on price and if he buys from firms known to produce quality products and not shoddy products and if he insists on quality control being exercised by the electroplater. The purchaser should set up specifications as to plates and plate thicknesses and have check tests made from time to time to determine conformity to these specifications.

Acknowledgments

Grateful acknowledgment is given to Philip Sievering, Inc., 199 Lafayette St., New York, N. Y., for their cooperation in applying the quality plate to the discs included in this study.

Specifications for Electrical Fittings*

I wonder if it is generally known that the electrical manufacturers are getting together and issuing new specifications for rust protection of electrical fittings, conduits, etc.

The new requirements are that the above mentioned parts shall withstand four Preece dips. This specification works to the distinct disadvantage of the electroplaters. It is known that the Preece test gives rather dissimilar results, depending, among other things, on the method which was used in applying the zinc.

I refer you in this connection to a paper on **"Preece Test (Copper-Sulphate Dip) for Zinc Coatings,"** by **E. C. Groesbeck** and **H. H. Walkup,** published as Research Paper R.P. 688 in Bureau of Standards Journal of Research, Vol. 12, June, 1934. On page 793 you will find that four Preece dips dissolve 0.733 oz./sq. ft. from pure zinc wire, 0.873 oz./sq. ft. from electroplated wire, 0.644 oz./sq. ft. from hot dipped wire, 0.448 oz./sq. ft from galvannealed wire and 0.957 oz./sq. ft. from zinc sprayed wire. It should be noted that the galvannealed coating is most strongly alloyed with iron and that the hot dipped coating is also alloyed with iron.

Thus, not only do the zinc iron alloys dissolve more slowly than pure zinc, but the loss in weight also includes dissolved iron, which of course, doesn't contribute to the protection. In other words, the figures given for the hot dipped wire and to even larger extent for the galvannealed wire would be decreased still further if the zinc only had been taken into consideration.

This means that in order to meet the above mentioned specifications, the electroplater has to apply more than 35% more zinc than the hot galvanizer and more than 95% more zinc than the one that uses galvannealed zinc. This should make the electroplaters sit up and take notice.

I believe that we should consider the advisability of including heavier zinc coatings in our new specifications; accompanied by a definite statement that this heavier coating will give the same rust protection as the four Preece dip hot galvanized coating.

Gustaf Soderberg.
The Udylite Company, Detroit, Mich.

This timely information has been referred to the Committee on Quality Specifications of the Master Electro Platers' Institute.

*From the Bulletin of the Master Electro Platers' Institute, February-March, 1936.

Specifications for Metals

File These With The Brass Founders' Manual

It has been pointed out to us that the specifications for lead given on page 177 of the May, 1936 issue of **Metal Industry** are now obsolete. Within the last two years, the American Society for Testing Materials has completely revised the lead specifications which are given below.

Specifications for Lead

Of the American Society for Testing Materials

Corroding Lead (Grade I):

Silver, max., per cent	0.0015
Copper, max., per cent	0.0015
Copper and silver together, max., per cent	0.0025
Arsenic, max., per cent	0.0015
Antimony and tin together, max., per cent	0.0095
Zinc, max., per cent	0.0015
Iron, max., per cent	0.002
Bismuth, max., per cent	0.05
Lead (by difference), min., per cent	99.94

Note. The maximum limits for bismuth, copper and silver have been given, but it is not expected that any delivery will contain the maximum of all three.

Chemical Lead (Grade II):

Chemical Lead (Grade II) is a designation that has been used for many years in the trade to describe the undesilvered lead produced from Southeastern Missouri ores.

Silver, per cent	0.020 max. 0.002 min.
Copper, per cent	0.080 max. 0.040 min.
Antimony, arsenic and tin together, max., per cent	0.002
Zinc, max., per cent	0.001
Iron, max., per cent	0.0015
Bismuth, max., per cent	0.005
Lead (by difference), min., per cent	99.90

Common Lead (Grade III):

Silver, max., per cent	0.002
Copper, max., per cent	0.0025
Arsenic, antimony and tin together, max., per cent	0.015
Bismuth, max., per cent	0.15
Iron, max., per cent	0.002
Zinc, max., per cent	0.002
Lead (by difference), min., per cent	99.85

Note—Common lead (Grade IIIa) conforms to the above analysis except that bismuth shall not be over 0.25 per cent and the total purity shall not be less than 99.73 per cent lead.

How to Estimate Job Plating

By PHILIP SIEVERING, JR.
Philip Sievering, Inc., New York

A Simple Method of Making Safe and Reasonable Estimates, and How to Check Them.

WHEN a new job is brought in for a quotation, do you estimate carefully or do you guess?

Most platers guess!

If they guess too high they lose the job. If they guess too low they lose money—and that is worse.

What is a **quick, simple, reliable** method of estimating?

You will be safe if you use the following rules:

1. Never take a job at what seems to be a low figure just because another plater did it at that price, because:

a. The other plater may have guessed too low. He may be losing money without knowing it.

b. It may be only a trial lot price which was later raised.

2. Never give a Final Estimate until you have run through a sample lot.

3. Prepare your Preliminary Estimate by the following method:

Total Direct Labor

Estimate the time for **every operation**;

Cutting Down
Racking
Cleaning
Plating
Rinsing
Drying
Buffing
Lacquering

Some of these operations may be repeated 2 or 3 times. **Be sure to include every one.**

Figure the **labor cost** for each operation—**polishers, platers, boys.**

Add them up for **Total Direct Labor Cost.**

Multiply this Total by at least 2 to 2½ which includes overhead and profit, to get your Sales Price.

For gold and silver work add the cost of the metal. **It is precious.**

How to Check Your Estimate

1. On general chromium plating work you should get from **$2.50 to $3.00** for **every hour** of each **polisher's** and **buffer's time.**

2. The cost of **polishing and buffing labor** should be about **25%** of the **Total Cost.**

3. The cost of **plating room labor** should be about **15%** of the **Total Cost.**

4. **Other (indirect) labor**—about **5 to 10%** of the Total Cost.

5. The **balance**—about **50%**—is Overhead: Materials; Rent; Power; Gas, Water, Oil; Insurance; Trucking; Telephone, Stationery, Stamps; **Bad Debts & Discounts; Repairs & Depreciation.**

You can't leave out any of these items. You pay for them in cash.

Warning

Be prepared to revise your Preliminary Estimate after you have run through a sample lot. You may find out many things you didn't know before.

After running the sample lot you can submit a Final Quotation based on actual experience.

There is no other safe way.

Spinning Brass Tubes

Q.—We are having considerable trouble with spinning brass. We want to make a tube 2¼" inside diameter and 5½" long, and we have been spinning these out of brass tubing. We find, after we spin and anneal it, it cracks.

We are just wondering if there is any way this should be annealed to get rid of the strain or whatever it is that causes it to crack.

A.—The brass that you are using is probably too low in copper. Try a high copper, or red brass sample. Also anneal the brass before spinning so as to insure the greatest ductility and thus reduce the chances of cracking.

A muffle furnace is the safest to use for annealing. If you do not have this equipment use an iron plate heated with gas or use an electric plate, and cover the brass with charcoal. Copper is the best cold spinning metal. Zinc must be warmed and kept annealed in order to prevent cracking. Brass is a combination of copper and various percentages of zinc. Yellow brass is high in zinc, and red brass is low in zinc.

We suggest that you anneal a sample of your present stock by heating to redness followed by either slow or rapid cooling before spinning. The cold spinning hardens the metal and causes internal stresses. Another experiment with your present stock is to apply a row of small gas jets to the length of the tube during the spinning operation. This constant heating tends to prevent the hardening effect from the spinning operation.

If these suggestions do not give you a satisfactory solution to your problem send us samples of the brass showing its condition both before and after spinning.

—W. B. Francis.

Beryllium-Copper-Cobalt Alloys

By F. G. BENFORD

Works Laboratory, General Electric Company, Pittsfield, Mass.

Adding Cobalt to Beryllium-Copper Reduces the Amount of Beryllium Necessary.

THE beryllium-copper alloys, both with and without addition of nickel, have received favorable attention in the last few years as dynamic structural materials. Their excellent spring characteristics, high fatigue resistance, and ability to be heat-treated following forming, provide an unusual combination of properties. These alloys are the first important group of precipitation-hardening copper-base alloys, and as such have been of considerable metallurgical interest.

It has been found that the addition of cobalt to the binary beryllium-copper alloys results in a lowering of the amount of beryllium necessary for heat-treating to optimum physical properties. As the cobalt in effect replaces a major part of the expensive beryllium, this ternary alloy has a lower metal cost.

Upon investigation[1], it was found that alloys of the ternary system, copper-cobalt-beryllium, offered a somewhat different set of properties from those exhibited by the binary beryllium-copper alloys. Instead of a tensile strength of 120,000 to 180,000 pounds per square inch and a conductivity of 20 to 30%, the ternary alloys have strengths of about 90,000 to 110,000 pounds per square inch, and conductivities of 45 to 50%. A further difference lies in the temperatures which the heat-treated alloys will stand without softening upon subsequent cooling to room temperature. The binary alloys will anneal in the range 260 to 300° C, while the usual cobalt-modified alloy will withstand 475° C without softening.

From a study of these properties, it was decided that the copper-cobalt-beryllium alloys offered great promise as materials combining high strength, hardness and high conductivity. The tensile properties listed in table No. 1 compare favorably with those of a good alloy structural steel, while the electrical and thermal conductivities are twice those of any other high strength alloy.

The values given below are for an alloy of the nominal composition 0.4% beryllium, 2.6% cobalt, 97% copper. This patented alloy, known as Trodaloy No. 1, is manufactured by the the General Electric Company.

TABLE 1.

	Heat-treated (hard)
Tensile Strength (No./in²)	90,000-100,000
Proportional Limit (No./in²)	45,000
Elongation (in 2")	10-20%
Hardness—Rockwell B	92-98
Electrical Conductivity (IACS)	49-52%

The lower set of values given in each case is for cast specimens; the higher values were obtained on wrought samples.

The principal use of a material combining these properties has been in resistance welding equipment. Good conductivity, resistance to deformation (hardness), and ability to withstand severe heat, are the principal requirements of resistance welding electrodes. As it fulfills these requirements to such a remarkable degree, and at such a comparatively low cost, Trodaloy No. 1 has had increasing use as electrode material for all types of stainless steel resistance welding-spot, seam, flash and projection—and the flash and projection welding of carbon steel. Its hardness prevents the flattening and deformation which copper suffers in such service, and its ductility prevents the cracking and spalling. Furthermore, being a heat-treated alloy, Trodaloy No. 1 is not subject to the annealing influence which all cold-worked electrode materials must endure in welding service.

Resistance Welding Units and Soldering Iron Unit Made of Copper-Cobalt-Beryllium

This alloy can be produced in castings, forgings, rolled plate and strip and cold-drawn rod and wire. It will be noted from the table above that some hardening is imparted to the alloy by cold-working before heat-treatment, but that most of the hardening is brought about by the heat-treatment. As a result, complicated electrode shapes may be produced when desirable by casting, with the wrought materials being used wherever expedient.

In addition to its use as an electrode material, this alloy has been used with considerable success in electric soldering iron tips, pole shaders, and other applications.

[1] "The Present Status of Age-Hardening", Dr. R. H. Harrington, Trans. Amer. Soc. for Steel Treating, Vol. 22, 1934, pp. 505-532.

Editorial Comment

A Record Convention

THE 24th Annual Convention of the American Electro-Platers' Society has come and gone. Faced with the difficult job, equalling the outstanding convention held last year in Bridgeport, the Cleveland Branch picked up its load and walked off with it easily. Registration and attendance at the annual banquet broke all records. The plant visitations were a revelation. The technical sessions have never been surpassed.

Our congratulations go to the winners of prizes, **Walter R. Meyer, Dr. D. A. Cotton, Joseph Singler, W. D. Scott and J. P. Sexton;** also to that outstanding branch, **Bridgeport,** which won the **Metal Industry** cup for the second year in succession. Hearty hand-shakes to **Walter Fraine and Daniel Wittig,** who were elected Honorary Members in recognition of their long and outstanding service to the Society.

The Society has shown great courage in taking the step of having a full-time executive secretary. We wish them well and we stand, as always, ready to help the organization and the man chosen for the job, in every way that we can.

Plating Plant Economies

NINE out of ten plating shop owners or managers are firm in the conviction that theirs is the best shop of its kind, producing the best jobs at the lowest cost, etc., etc. Hence, the age-old tendency to take a job at what another plater has quoted. "If he can do it at that price, so can I!"

How many platers have actually gone over their shops, point by point, to make sure that it is economically run? Here are some of the places for savings, outlined in the April issue of the Mid West Record of the Master Electro-Platers' Association of the Mid West: bright nickel plating to eliminate buffing and coloring; care in keeping down the peak power loads to reduce demand charges; careful rack insulation to save current leaks; efficient (or in other words, sensible) plant layout to save steps; purchasing copper wire in not less than 100-pound lots to get the benefit of price reductions; the use of high current densities to get out much more production with the same floor space; the use of a microscope to get a quick check on the plate deposited, thus saving returns from customers; keeping generator brushes in good shape to reduce current losses; the use of special racks to eliminate as much labor as possible in handling the work; proper ventilation to keep employees' efficiency at the peak; proper illumination for the same reason; elimination of obsolete equipment which uses more power and turns out less work than up-to-date machinery; keeping all equipment in good operating condition as otherwise they become "power hogs"; inspection of polished work before plating, preventing many rejections after plating and thus saving stripping and subsequent buffing costs, both in labor and materials; accurate current, temperature, and solution control; accurate cost records to check estimates and inform the owner immediately about discrepancies.

Are these all of the economies possible? By no means. But we have no doubt that any plater, in going through the above list, will find some that he has overlooked in his own shop.

Colored Metal Deposits

ONE of the new fields for electroplating which has attracted attention within the past few years is the plating of colored deposits. Metal coloring by chemical means has, of course, been known for many years. Electroplating of colors, however, is really new and from many indications seems to be only in its infancy. Carl Heussner of the Chrysler Corporation in a recent talk to members of the Springfield Engineers Club predicted that within the next five years color plating of metals will be commercially possible and will be widely in use for plumbing and electrical fixtures and in the automotive industries.

It is something to which we may look forward with real interest and hope.

Business Progress

ACCORDING to all reports, industrial activity advanced sharply in April, the rise being led by steel, automobiles, building and machine tools. Retail trade was spotty, doing well in rural areas but lagging in urban centers. The hard winter retarded business more than has been generally realized; also the floods have held back a great deal of purchasing.

The encouraging feature is the improvement in the heavy industries carrying with it an increase in employment of about 200,000, according to the National Industrial Conference Board.

The automobile industry still continues to be the most important factor in our present recovery although it has passed its seasonal peak. Building is being anxiously watched to see if it continues to gain.

Unemployment is still our most pressing problem. Where can the millions be re-employed? According to the National Industrial Conference Board the manufacturing industries may be expected to give employment to about 3,000,000 additional workers if activity returns to 1929 levels.

Out of a total of about 9,200,000 unemployed in December, 1935, the breakdown is as follows:

Mining	561,000
Manufacturing	2,775,000
Construction	964,000
Transportation and Communication	1,459,000
Trade	1,198,000
Miscellaneous (including agriculture, forestry, finishing, individual hand trades, public service, professional, domestic and personal services, etc.)	2,220,000
Total	9,177,000

These figures indicate that if we were to return to the state of industry for the population of 1935 parallel to that which existed in 1929, more than two-thirds of the unemployed must be absorbed in activities other than manufacturing.

If manufacturing, and particularly the heavy industries, continue to climb, the others will probably follow along as suppliers and allied and subsidiary industries acquire momentum.

Correspondence and Discussion

Compliments from Far and Wide

To the Editor of **Metal Industry**:

It may interest you to know how largely **Metal Industry** is read throughout the country. I have received at least 20 letters complimenting me on my article, "A History of the American Graphite Crucible," that appeared in your March number. Naturally, most of them came from old-time friends, some of whom I had lost all track of and I got quite a kick from seeing an old familiar name at the bottom of a letter. It sort of put me back on a lost trail.

One of the compliments came from an old-time neighbor who had moved away to some unknown parts. I couldn't understand how he would ever come in contact with **Metal Industry** because as I knew him his business was far removed from any foundry. I finally located him as the head of a plating plant down in South Jersey doing a very profitable business.

Other letters were from Racine, Wis.; Birmingham, Ala.; Baltimore, Md.; Saginaw, Mich., and one as far away as San Francisco.

You ought to be proud and I ought to get a cigar for telling you these nice things. Anyhow, please pass my good wishes along to the staff and believe me to be,

JONATHAN BARTLEY.
Bloomfield, N. J.

New Books

Metal Statistics. Published by American Metal Market. Size 4 x 6, 572 pages. Price $2.00.

The 29th annual edition of this well known standard book of metal statistics, presents figures on production, consumption and price movements of nonferrous metals. This edition contains numerous additions in the tin, lead, silver and gold sections as well as information compiled from the official monthly reports of the Copper Institute.

Symposium on Industrial Fuels. Published by American Society for Testing Materials. Size 6 x 9; 70 pages. Price 75c per copy; 60c each on orders of 10 or more copies.

A compilation of four extensive technical papers on coal and coke; industrial oil fuels; manufactured gas; liquified petroleum gas.

Structure of Metals and Alloys, by Dr. William Hume-Rothery. Published by Institute of Metals, 36 Victoria Street, London, S. W. 1, England. Size 5½ x 8¼; 120 pages, 61 illustrations. Price 3s. 6d.

This is Monograph and Report Series No. 1 of the British Institute of Metals. It is composed of sections on the electronic background of metallurgy; the crystal structure of the elements; atomic radii of the elements; primary metallic solid solutions; intermediate phases in alloy systems; imperfections in crystals.

The book contains no higher mathematics, the reader being required to know only simple arithmetic, a little trigonometry and a little algebra. It is to be highly recommended as a clear, simply written text book in fundamental metallurgy.

The Chemical Formulary, Volume 3, by H. Bennett, Editor-in-Chief. Size 5½ x 8½; 566 pages. Published by D. Van Nostrand Company. Distributed by Chemical Publishing Company of New York, Inc. Price $6.00.

An additional volume, companion to Volumes 1 and 2 of the same title, which were issued during the last two years. It is stated that Volume 3 is entirely different from 1 and 2. Contents includes material on: Adhesives, Paints, Lacquers, etc.; Cosmetics and Drugs; Emulsions; Farm and Garden Specialties; Food Products, Beverages and Flavors; Inks and Marking Compounds; Leather, Skins and Furs; Lubricants, Oils, Fats; Materials of Construction; Paper; Photography; Plating; Polishes, Abrasives; Pyrotechnics Rubber, Resins, Waxes, Plastics; Soaps, Cleaners; Textiles, Fibers; Miscellaneous Specialties.

Elements of Diesel Engineering, by Orville Adams, Consulting Engineer. Published by Norman W. Henley Publishing Company. Size 6 x 9; 478 pages. Price $4.00.

This book which comes at a time when interest in Diesel engines is growing, covers the subject in all its branches, stationary, marine, locomotive, and automotive Diesel engineering. It describes the working principles of the Diesel engine: compression, ignition, combustion, fuel injection and spray atomization.

One of the interesting innovations of the book is a set of questions and answers at the end of every chapter.

Technical Publications

Distillation and Separation of Arsenic, Antimony and Tin, by **John A. Scherrer.** Research Paper RP 871. National Bureau of Standards, Washington, D. C. Part of Journal of Research of the National Bureau of Standards, Volume 16, March, 1936.

Some Recent Investigations on the Corrosion of Tin, by **D. J. MacNaughtan** and **E. S. Hedges.** International Tin Research and Development Council, 149 Broadway, N. Y.

American Standards for Rotating Electrical Machinery. Standard requirements and specifications from the large central station generators and industrial and steel mill motors to the small motors used on household appliances. American Standards Association, 29 W. 39th Street, New York.

Electrodeposition Versus Electronics, by M. E. Steinbach, East Orange, N. J. Journal of the American Electronic Research Association, 529 State Life Building, Indianapolis, Ind.

Corrective Measure and Electronic Applications, by M. E. Steinbach, Journal of the American Electronic Research Association, 529 State Life Building, Indianapolis, Ind.

Tentative Specifications for Electrodeposited Coatings of Zinc, Cadmium, Nickel and Chromium on Steel. Published by American Electro-Platers' Society, 90 Maynard Street, Springfield, Mass., and American Society for Testing Materials, 260 South Broad Street, Philadelphia. 25c per copy; 20c per copy in lots of 10 to 24.

The Corrosion of Tinplate. Technical Publication No. 30, Series A of the International Tin Research and Development Council, 149 Broadway, New York.

Units of Weight and Measure (United States Customary and Metric) Definitions and Tables of Equivalents. Miscellaneous publication M 121 (Superseding Circular C47), National Bureau of Standards, Washington, D. C. Obtainable from the Superintendent of Documents, Washington, D. C., for 15 cents.

The Cause and Prevention of Steam Turbine Blade Deposits, by Frederick G. Straub. Bulletin No. 282, Engineering Experiment Station. Published by the University of Illinois, Urbana, Ill. Price 55 cents.

An Investigation of the Durability of Molding Sands, by Carl H. Casberg and Carl E. Schubert. Bulletin No. 281. Engineering Experiment Station. Published by the University of Illinois, Urbana, Ill.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice

METALLURGICAL, FOUNDRY, ROLLING MILL, MECHANICAL, ELECTRO-PLATING, POLISHING, AND METAL FINISHING

Associate Editors

H. M. ST. JOHN
W. J. PETTIS
W. J. REARDON
W. B. FRANCIS
T. H. CHAMBERLAIN
WALTER FRAINE
G. BYRON HOGABOOM

Black on Aluminum

Q.—Please outline a method of obtaining a deep black on aluminum and duraluminum, which will not wash off and will stand considerable wear.

We prefer a finish which is an integral part of metal rather than a lacquer.

A.—A black color may be obtained directly on aluminum or duraluminum by immersion in the following solution:

Potassium permanganate	1½ ozs.
Nitric acid 20 deg. Be	1/3 oz.
Copper nitrate	4 ozs.
Water	1 gal.
Temperature	175 deg. F.

Time to obtain deep black, 20 to 30 minutes. It is necessary to lacquer parts after coloring to preserve finish. A clear transparent lacquer should be used.

—T. H. C., Problem 5,498.

Brightening Tin Plate

Q.—We are hot tinning steel strip and it is desired that the resulting strip be bright and have a very shiny luster. On a material which we have produced to date, the product has numerous white spots. We are, therefore, wondering what you would recommend as a brightener for this type of work, so that it would be uniformly shiny.

A.—The method you are using for hot tinning steel strip is not mentioned in your letter. The white spots may be due to the dragging through of the zinc chloride flux. This can be caused by excessive speed through tinning bath or inadequate means for final wiping or cleaning.

A common procedure used for hot tinning consists of pickling the steel strip in a hot 2% sulphuric acid bath at 170-180 deg. F. then rinsing in cold water. It is essential of course to have steel clean before pickling. After pickling the strip is passed through zinc chloride flux than through tin bath, which has a layer of palm or cottonseed oil. In some instances two tin baths are used the first being run at a somewhat higher temperature than the second.

The temperature of the tin should be around 570 deg. F. for good results, while the temperature of the oil layer should be around 475 deg. F.

The strip should be run between rolls to squeeze off excess tin as it leaves bath. The oil can be removed by rubbing with some substance such as bran or middlings.

The strip is then cleaned by running through a hot 1% sodium hydroxide bath, rinsed first in cold water, then in hot water for drying. This will produce a high lustre on tinned strip.

If an oil layer is not used on tinning bath some suitable means for wiping should be employed as strip leaves bath. A wipe made of loose stranded cotton rope about ⅜" diameter can be employed to good advantage. After wiping strip is passed through alkaline bath as mentioned above.

—T. H. C., Problem 5,499.

Bright Tin Solution

Q.—We are interested in a bright tin finish. We assume that this result can be obtained by either adding some chemicals to the plating solution or by subsequently treating tin plated metal parts.

Will you please advise us just how this can be accomplished?

A.—The addition of a small amount of powdered rosin to a tin bath (3 ozs. to 100 gallons of solution) will help produce a bright deposit.

The lustre obtained from an electro tin bath is usually not of high brilliance and it is necessary to roll parts to produce a bright finish. The rolling can be done in an open and oblique wood barrel using a neutral soap solution until desired lustre is brought up. Rolling time should not be over ten minutes. After rolling parts are rinsed in cold water then dried by rolling in cold hardwood sawdust in similar type barrel mentioned.

—T. H. C., Problem 5,500.

Discolored Die Castings

Q.—You no doubt know that we were under 10 feet of water March 18th, and our complete stock of die cast end plates, pulleys, spacers, and so forth were under water. They are discolored and need some cleaning process that will remove the oxide and discoloration thus giving us a clean bright finished plate.

What do you suggest we should do to clean up these zinc die castings?

A.—It is not quite clear as to whether die castings are plated. If they are nickel plated it would be necessary to give them a coloring operation on a soft buff wheel using a nickel coloring compound such as lime to bring back their lustre. If the zinc die castings

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all items if possible.

Date.....

Name ..... **Class of work being plated:** .....

Address ..... **Volume used:** .....

Employed by: ..... **Solution depth:** .....

Kind of solution: ..... **Cathode surface, sq. ft.:** .....

Tank length: ..... **width:** ..... **Kind of anodes:** .....

Anode surface, sq. ft.: ..... **Distance from cathode** ..... **Original formula of solution:** .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible. Use separate sheet if necessary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

are in the raw condition and they are oxidized it will be necessary to buff such a film off, to obtain a bright finish. This may be accomplished by buffing on a cloth wheel using a free cutting tripoli, then color on cloth wheel using a soft dry white compound. Peripheral speed 5000-6000 ft. per minute.

—T. H. C., Problem 5,501.

Drossy Antimonial Lead

Q.—We have been running into a little difficulty in making up our finished product of 10% antimonial lead.

We smelt scrap battery lead plates in a blast furnace and the finished product is a little drossy. Could you give us the reason why this material is drossy and also how we could eliminate the same?

A.—Some idea of the amount of composition of battery mud which is available for separation might be obtained from the elements entering into a new battery which is estimated as follows:

	New Battery	Scrap Battery	Battery Mud
Antimonial lead	17.80	17.80	3.19
Yellow litharge	6.88	....	....
Red litharge	3.46	....	....
Lead peroxide	....	3.62	3.62
Lead sulphate	.43	5.02	2.00
Wood separators	.84	.84	.42
Taps and plugs	.55	.55	....
Asphalt compound	.17	.17	....
Foreign substance	....	1.50	1.50
Dry pounds	30.13	29.50	10.73

The smelting of battery mud is difficult in any type furnace. The antimonial lead melts easily; also the sponge lead. The peroxide of lead is more difficult to reduce than might be expected, and the lead sulphate more difficult, and this causes the lead to oxidize somewhat and causes dross.

So to eliminate this drossy condition we suggest refining of the recovered metal by boiling the metal by inserting green hickory pole to the bottom of the holding pot, and flux with rosin. Keep this refining process up until all the oxides are eliminated, and the metal runs clean and free from the pouring ladle into the mold. This, we believe will help considerably.

Some people use old leather for refining instead of green wood and get good results. Old shoes are said to be excellent material to use in refining such products.

—W. J. R., Problem 5,502.

Pattern Alloy

Q.—We are interested in an aluminum pattern alloy which will cast easily and with the least amount of shrinkage.

A.—A very good pattern alloy, one that will cast easily with the minimum shrinkage, is composed of:

87 aluminum
10 copper
3 silicon

Made as follows:

melt 50 copper
15 silicon
35 aluminum

Pour into ingots and use as hardener as follows:

melt 80% aluminum
add 20% hardener

We believe this will answer your purpose. Smaller percentage of hardener can be made up if dsired.

—W. J. R., Problem 5,503.

Stripping Nickel and Chromium

Q.—Will you give me some information on stripping chromium and nickel from die castings? I am also having trouble with black in my nickel solution on the leaf part of a hinge.

A.—In stripping chromium and nickel deposits from die cast metal the work is made anode in a concentrated solution of sulphuric acid. Use the acid straight from the carboy. If a small amount of glycerin is added the attack on the basis metal will be reduced.

The strip should be kept covered so as to reduce the absorption of moisture. When the water content of the strip increases to the point where pitting of the die cast occurs a new dip should be made up or the old one can be heated until all water is driven off.

If the work you are plating is deeply recessed it will be difficult to apply nickel directly without running into trouble from black deposits. In such cases it is better to apply a cyanide copper coating before the nickel. The thickness of copper should be not less than .0003". If less than that the copper will be absorbed by the zinc and peeling of the nickel will take place.

—G. B. H. Jr., Problem 5,504.

Polishing Stainless Steel

Q.—Having recently entered the field of stainless steel fabrication, we occasionally find ourselves confronted with the problem of finish.

Our requirement is to polish these articles after fabrication, and if possible, to match the polish of the weld with that of the sheet. A portable method is necessary, as most of the pieces are too large to handle easily.

A.—The amount of grinding and polishing required depends largely upon finish of sheet. If weld is rough and badly oxidized it may be necessary to start grinding operation with 80 mesh grit abrasive with successive grinding with 120, 150, 180 and 200 mesh abrasives. It is essential that all marks and scratches from previous grinding be removed before starting with a finer grinding. One type of wheel for grinding may be a soft grease wheel covered with abrasive. Various types of abrasives can be used, such as silicon, carbide, alumdum, etc. For greasing the wheel a grease of high melting paint should be used, preferably of stearic base. Abrasives should be free of iron. Another type of wheel may be a free cutting wheel made up with necessary grit bonded in rubber, bakelite or some similar base. Cup shaped wheels are preferable to plain disc types.

After weld has been given polishing operation it may be given either tampico brushed, high lustre or mirror finish. Stainless steel sheets polished at mill are difficult to match since original sheets are polished across entire surface in one operation, whereas, the use of a hand polishing wheel will tend to cause laps due to short strokes used.

Tampico brush finish is obtained by brushing with an abrasive of suitable mesh saturated in oil. High lustre or mirror finish is obtained by buffing with green chrome oxide grease stick or other similar suitable material. Wheels for polishing or buffing can be made from muslin discs with or without cardboard spacers. Sewed buffs also give good results.

Speed of wheels for grinding should not exceed 8,000 feet per minute. A 14" wheel requires a spindle speed of about 1,750 R.P.M., to 1,800 R.P.M. For buffing a speed of about 8,500 to 12,000 feet per minute should be used, which for a 14" buffing wheel means a spindle speed about 2,400 R.P.M.

—T. H. C., Problem 5,505.

Silver Solution—Silver Scale

Q.—I have of late trouble with my silver plating solution. It plates brown and it is hard to color. It plated fine for several years, but now it also peels. I'm sending you sample of the strike solution and of the regular plating solution.

I also would like to know if there is a dip for the scale that forms on the hollowware such as, tea pots and the like, or has it got to be polished off. I don't mean the black oxide that cyanide will take off, but regular scale.

A.—The results of the analyses on your silver solutions are as follows:

	Plating Solution	Strike
Silver (tr. ozs./gal.)	2.41	.82
Free cyanide (ozs./gal.)	4.68	8.17

The free cyanide in the regular plating solution is slightly high but not excessively so. Make no further additions of cyanide for the time being.

The strike solution is in a satisfactory condition although the silver content is slightly high and no more of this metal should be added.

It appears as though some impurities have accumulated in the solution, possibly copper or lead and that these elements are causing your trouble of obtaining a brown color deposit.

This brown coloration may also be caused by operating the solution too warm. We therefore suggest checking the temperature and making sure that it is not over 80° F. Also, the use of excessive carbon disulphide will cause brown discolorations on the work.

The scale can be removed by pickling in a 6 to 8% solution of sulphuric acid which contains 2 ozs. per gal. of sodium dichromate. Use at 180° F. then buff the work.

—G. B. H. Jr., Problem 5,506.

Practical Brass Foundry Digest

By H. M. ST. JOHN

Chief Metallurgist, Detroit Lubricator Company; Associate Editor, METAL INDUSTRY.

Short Abstracts of Articles of Interest to Practical Non-Ferrous Foundrymen and Metallurgists.

Founding **Magnesium Alloys. John A. Gann and Manley E. Brooks.** Foundry, Vol. 64, page 32 (Feb., 1936).

First installment of a paper describing methods used in melting and casting Dowmetal (Magnesium containing small proportions of aluminum, manganese and sometimes zinc). Low-carbon cast steel pots are used. The metal is puddled into a heel of molten flux consisting of 60 per cent anhydrous magnesium chloride and 40 per cent sodium chloride. Although the metal floats on the flux, the latter forms a protective film over the surface of the metal and between the metal and the steel. Impurities collect in the flux. The metal is ladled out for casting as required, replaced by fresh additions to the bath. The special technique necessary is described in detail, particularly with reference to the use of scrap and shavings. Zinc alloys readily with magnesium but a hardener must be used to introduce the manganese. Since hot magnesium is vigorously attacked by the water in ordinary green sand, moulding sand must be prepared by the addition of such substances as sulphur, boric acid and ammonium fluoride, which form a film of gas between the sand and the metal. A synthetic sand, 100 to 150 mesh silica sand mixed with 4% bentonite and tempered with a 75-25 water-glycol mixture, is used. Gating methods are described in detail. A shrinkage factor of 5/32 to 3/16 is used depending upon the design of the casting. Green sand cores are used whenever possible; dry-sand cores are made from an open sand containing sulphur and boric acid with an oil binder. These are baked at 350°-500° F., washed with a graphite-alcohol mixture and the alcohol burned off.

Fiftieth Anniversary Marks Progress in Casting Aluminum. H. J. Rowe. Foundry, Vol. 64, page 22 (Feb., 1936).

A general review describing modern practice and applications of aluminum castings.

Methods and Equipment in the Non-Ferrous Foundry. A. Logan. Metal Industry (London), Vol. 48, page 103 (Jan. 17, 1936).

A review of developments in British practice during 1935. Natural-draft pit-type coke-fired crucible furnaces, in spite of their slow and inefficient melting, are still most generally used, possibly because they do produce metal of excellent quality and it is expensive to change to more rapid and efficient modern equipment. Forced-draft coke furnaces and oil-fired non-crucible furnaces have made considerable headway. The introduction of the rocking arc electric furnace has been a significant development. There has been an increased interest in the selection, treatment and control of moulding sands.

The Casting and Treatment of Magnesium Alloys. A. J. Murphy. Metal Industry (London), Vol. 48, page 108 (Jan. 17, 1936).

A review of British practice covering sand casting, die casting and heat treatment of the magnesium-aluminum-zinc-manganese alloys. Elektron castings are finding a steadily increasing use in the aircraft and automobile industries as well as for their resistance to corrosion by certain chemicals, notably hydrofluoric acid.

Light Alloy Practice: Aluminum Alloys. H. G. Warrington. Metal Industry (London), Vol. 48, page 160 (Jan., 1936).

A partial list of alloys used in the aircraft industry is given. All of these contain more or less silicon, most of them copper, magnesium, nickel and iron as well. Manganese and titanium are occasionally present in small proportions and in one instance 13% zinc is specified. Moulding sand, cores and gating are discussed. Gas and oil are the usual fuels with graphite or cast iron crucibles for sand or gravity castings. Die casting methods are also described.

The Possibilities of Gas Fuel in the Non-Ferrous Metal Industries. Joseph E. White. Metal Industry (London), Vol. 48, page 167 (Jan. 31st, 1936).

Figures are given to show that satisfactory castings are obtained at lower cost when city gas is substituted for fuel oil.

Industrial X-Rays. Robert C. Woods. Metals and Alloys, Vol. 7, page 45 (Feb. 1936).

Following a simply worded description of how x-rays work, their use for the detection of flaws in castings and other metal articles is discussed. As a rule defects of a size about 1½ to 2% the thickness of the metal piece can be discerned.

Progress in the Production of Cast Bronzes. Francis W. Rowe. Metallurgia, Vol. 13, page 119 (Feb. 1936).

Much difference of opinion exists with respect to gas absorption in the bronzes and the influence of furnace atmosphere during melting. It is generally agreed that a slightly oxidizing atmosphere gives less trouble than a reducing one, possibly because the latter reduces oxide impurities present in the metal or produces deleterious reduction compounds. The spread of electric melting, with its closer control, is likely to clear up some of the obscurity. The trend in melting equipment is away from crucibles toward open-flame furnaces, away from coke toward oil, gas and electricity. Crucible equipment is cheaply installed but slow and uneconomical in operation. Open-flame furnaces must be carefully controlled to keep metal losses down and prevent gassing of the metal. The principal disadvantages of the electric arc furnace are its high first cost and the objection, on electrical grounds, to its single-phase load. Metal losses are lower than in crucible furnaces, half those experienced in open flame furnaces. Electric furnaces are fast and economical provided it is possible to operate them steadily, at the power rates usually obtainable in industrial districts (0.4 to 0.6 d. per unit).

Progress in Melting and Heat Treatment Furnaces. Anon. Metallurgia, Vol. 13, page 133 (Feb. 1936).

Electric furnaces, open-flame furnaces and crucible furnaces are all in successful use. The durability of crucibles has been increased several hundred per cent while their size has been increased to a point where one ton of bronze may be melted at one heat. Other improvements have made the process more economical, particularly where oil and gas are used as fuels. Castings of the highest quality can be produced in crucibles with a metal loss, in most cases, well under 1%.

The Science and Practice of Machining Brass. Dr. Ing. M. Kronenberg. Metal Industry (London), Vol. 48, page 179 (Feb. 7th, 1936).

New Production and Research Laboratories. Anon. Metallurgia, Vol. 13, page 101 (Feb. 1936).

A description of the laboratory which develops and controls the products of High Duty Alloys Ltd. and its associated companies, Magnesium Castings and Products, Ltd., and High Duty Bronze, Ltd.

Modern Equipment

New and Useful Devices, Metals, Machinery and Supplies.

New Chromium Solution

A new chromium plating bath has been perfected which is entirely independent of the sulphate acid radical and similar acid catalysts, according to an announcement made by Dr. Ernest D. Wilson, president of the Standard Chromium Corporation, 521-5th Avenue, New York.

"The bath operates on a new principle which does not depend upon control of such acid radicals for its efficiency," Dr. Wilson stated, "and hence is chemically and legally dissimilar from patented processes based on such control. Moreover, striking technical advantages from the standpoint of operating range, throwing power, cathode, efficiency and character of the deposit are made possible by the newly perfected method."

Among the improved characteristics of the new plating bath, Dr. Wilson particularly emphasized the widened ranges of temperature and current density over which a bright plate can be secured, permitting commercial operation down to room temperature or as high as 180 deg. F. An increased throwing power is expected to simplify racking problems and eliminate much of the need for using special anodes.

Small Wheelabrator Tum-Blast

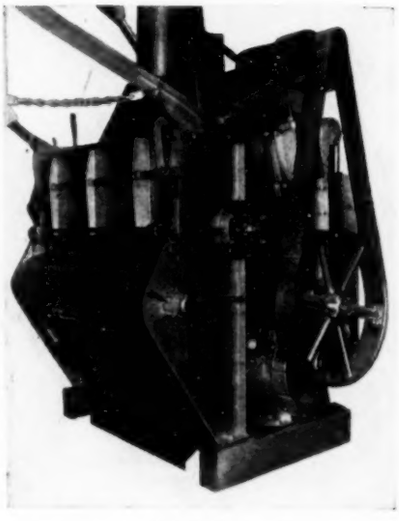
A new small Wheelabrator unit, *27" x 36"* designed especially for use in foundries, shops and plants having a limited production, is announced by The American Foundry Equipment Company, 408 Byrkit Street, Mishawaka, Ind.

The new Wheelabrator unit is installed in a new size Tum-Blast mill. While smaller in size, this mill is said to have all the desirable features of the larger Wheelabrator Tum-Blast.

Material to be cleaned is loaded directly onto the apron conveyor. When the mechanism is set in operation the action of the conveyor apron cascades the individual castings, over and over, directly under the blasting area. In unloading, the movement of the conveyor is reversed, allowing cleaned products to spill into waiting receptacles under the machine.

Improvements are incorporated in the construction. The door is counterweighted for easy operation. It swings up and provides an unobstructed opening for loading and unloading. It is completely equipped with dust seals. The apron conveyor can be provided with either overlap or flat type slats, depending on the type of material to be cleaned. Both slats are furnished with heavy-duty reinforcing channels.

Operating load capacity is 5 cubic feet.



Small Wheelabrator Tum-Blast

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Soluble Grinding Oil and Grinding Paste. E. F. Houghton and Company, 240 W. Somerset Street, Philadelphia, Pa.

New Radial Pump Providing Maximum Operating Dependability. Model 4R. The Hydraulic Press Mfg. Company, Mount Gilead, Ohio.

Heat Resisting Lacquer for Aluminum Ware. Dr. F. Loewenberg, 10 E. 40th Street, New York City.

"Non-Through-Metal" Panel. Herrington and Randall, Inc., 13700 Sherwood Street, Detroit, Mich.

Single Phase Induction Motor. Westinghouse Electric & Manufacturing Company, E. Pittsburgh, Pa.

Wheel Dressing Machine. Divine Bros. Company, Utica, N. Y.

Automatic Electric Glue Heater. Divine Bros. Company, Utica, N. Y.

Alasticflint — synthetic, bituminous, pure, red lead metal primer. Elastic Compound Paint Company, Church Lane and Lena Street, Germantown, Philadelphia, Pa.

Rust Inhibitive Primer. John W. Masury and Son, 42-50 Jay Street, Brooklyn, N. Y.

Weldmaster Welding Torch. Weight 17½ ounces, including standard tip. Modern Engineering Company, 3411 Pine Street, St. Louis, Mo.

Protex; rubber latex for protective coating for automobile bumpers, fenders, etc., being shipped and stored. American Anode, Inc., Akron, Ohio.

Pressure Switch; for the automatic control of small compressors and fluid pumps. Cutler-Hammer, Inc., 12th and St. Paul Avenue, Milwaukee, Wisc.

Colloidal Mixer; for mixing and dispersing of pigment colors and clays. Colloid Equipment Company, 50 Church Street, New York City.

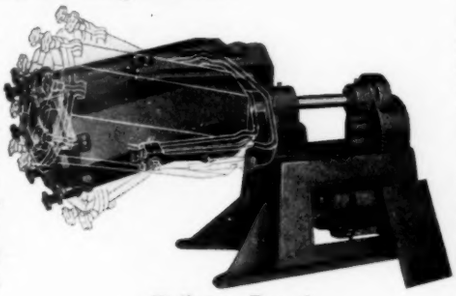
Protected Bearings; four new types for use in gravity conveyors. Standard Conveyor Company, North St. Paul, Minn.

Fulscope Indicating Controllers for Temperature and Pressure; air operated. Taylor Instrument Companies, Rochester, N. Y.

Motosteel Diaphragm Valve Motors. All-steel welded construction. Taylor Instrument Companies, Rochester, N. Y.

Tumbling and Burnishing Barrels

Chas. F. L'Hommedieu and Sons Company, 4521 Ogden Avenue, Chicago, Ill., have put out a new, Size 2, Type L burnishing barrel. This size is made so that the cylinder can be rotated, either in a horizontal position or at any other desired angle. This "double-action," it is stated, reduces the time required for burnishing. The barrel has a large capacity, can be loaded and unloaded easily and all working parts protected. Two speeds are available.



Reliance Barrel

Spray Gun Fluid Strainer

The DeVilbiss Company, Toledo, Ohio, has developed a new fluid strainer, Type VS, for attachment to the fluid inlet of the Type MBC Spray Gun.

The advantage of having the fluid strainer at the inlet of the gun rather than at the paint-tank outlet is said to lie in the fact that a slight residue of material in the line or other "dirt" may be carried to the spray gun if the paint is not strained at the last point before entering the gun. This may cause defects in the finished surface.

The working part of the strainer consists of a screen reinforced with coiled spring. This is inclosed in a metal tube. Fluid flow is from the outside to the inside of the screen. Screen is easily removable from the tube for cleaning.

Type VS Strainer is connected by means of its upper or outlet connection to the fluid inlet connection of the spray gun. The lower or inlet end of the strainer to which the fluid hose is connected, is fastened to the lower end of the gun handle so as to prevent undue strain on the upper connection. The latter is bent to give the strainer the proper angle for attaching the fluid hose, and to provide the best gun balance. Thus the strainer design permits the fluid hose to be attached near the air hose, and to run parallel with it, making the gun easy to handle.

DeVilbiss Fluid Strainer

Bright Zinc Deposit

A new and radically different type of zinc deposit, known as Grasselli Bright Zinc, is announced by The Grasselli Chemical Company, Cleveland, Ohio. In contrast to the old electro-galvanizing, which in most cases the deposits of zinc were dull, gray and porous, this new process is said to deposit zinc in a very brilliant, dense and ductile form.

These improvements in the electro-deposition of zinc are, it is stated, largely the result of the use of molybdenum, a recent development of the same company. The use of molybdenum in the electro-deposition of zinc may parallel its use in alloy steels. In contrast to the old methods of electro-galvanizing, it is claimed that this new process operates at normal room temperatures, higher current efficiencies, high or low current densities, with a bright plating range from 15-100 amperes per square foot, and provides economies unheard of in the old methods.

Synthetic Enamel Resists Heat and Alcohol

Most of the metal ash trays on the market are plated surfaces without any organic surface coating on them. Those that are so finished when used for a short length of time rapidly deteriorate, that is the coating tends to soften, blister and discolor. As a matter of fact, it seems to the writer that the majority of ash trays are of glass or plastic composition and this is probably due to the fact that heretofore no really satisfactory finish had been developed to resist the continued abuse of burning cigarettes.

A new high gloss baking enamel, Roxyn 12B, recently developed by the Roxalin Flexible Lacquer Company, Elizabeth, New Jersey, has, it is stated, withstood the heat of constantly burning cigarettes without any discoloration or softening. Special high temperature resistant pigments are used in this product to prevent discoloration. Bright reds and greens, which would normally discolor are available.

It is also claimed that when this enamel was applied on a coaster and then immersed in straight alcohol for one hour no failure of the finish occurred.

Roxyn 12B, can be applied by spraying or dipping and bakes for one hour at 300° F.

Chromizing

Cooper Products, Inc., 4503 Euclid Avenue, Cleveland, Ohio, have developed an improved patented process of chromizing, that is, of producing a casing of ferro-chrome on a foundation of simple steel or iron. In general the process is similar to case-hardening, calorizing, and other cementation processes. The article to be chromized is packed in a powder, one of whose ingredients is chromium metal, placed in a suitable crucible or carburizing box. It is then heated under suitable conditions at a temperature and for a length of time that depend on the thickness of the case or coating desired. Thus heating for about one hour at about 1850 degrees F., will it is stated, produce a casing of about .004" to .005" depth. With higher temperatures and longer heating very thick or deep cases or coatings can be produced. The coating penetrates the original steel and does not materially change the dimensions of the treated piece. The casing produced consists of stainless steel, that is, ferro-chrome analyzing 25% to 30% chromium, and it has all the stainless, non-tarnishing, heat resisting, and other

properties of such an alloy. It is claimed that the coating also has the workability, hardness, and other mechanical properties of ferro-chrome.

Cooper Products, Inc., are exclusively a research laboratory and at present has no manufacturing facilities. The products of this process are therefore not immediately available to industry, but steps are being taken to put them into production. One of the large steel companies is now doing work preliminary to manufacturing sheets, strips, etc., from chromized billets by this process. When these products become available, announcements will be made. Cooper Products solicit inquiries from those who manufacture articles that they feel might be treated advantageously by chromizing, and will be glad to cooperate by chromizing sample pieces in their laboratory.

Selective Speed Buffing and Polishing Machine

The Standard Electrical Tool Company of Evans & 8th Streets, Cincinnati, Ohio, have added to their line of buffing and polishing lathes a selective speed machine on which it is possible to obtain any spindle speed required. When equipped with patented adjustable speed sheaves a spindle speed increase of 50% may be obtained with an infinite number of steps.

The machine is powered by an 1800 RPM ball bearing motor. The air jacketed type of motor is recommended, although any available motor may be used. The design of this machine is of particular advantage in those districts where direct current is now in use and there is contemplated a change-over to alternating current. This machine may be installed with a direct current motor and when the current change-over occurs it is necessary only to change the electrical equipment on the buffing machine.

Fig. 1 Showing Hand Brake

It will be noted in Fig. 1 that a hand brake is provided for quickly stopping the spindle, reducing the time required for wheel changes. A shaft locking device further assists in changing wheels. The push button station at the front of the machine operates a magnetic starter located inside the pedestal. The starter has overload and under-voltage protection.

The spindle is made of high grade nickel steel and Fig. 2 illustrates the manner in which the power is transmitted to the buffing spindle by four "V" cog belts. An elevating screw permits raising and lowering the motor to take the tension on the belts. A hinged guard covers the belts and sheaves. The entire spindle may be removed intact for renewing belts without disturbing the ball bearings.

Oversize ball bearings are mounted in labyrinth sealed chambers and a sight oil feed at each bearing insures proper lubrication at all times.

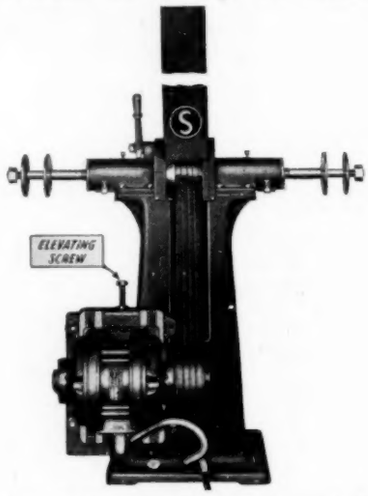


Figure 2 Showing Power Transmission by Four V Cog Belts

This machine is made in sizes of 3, 5, 7½, 10, 15 and 20 HP.

Apex Slide Rule

A circular calculator has been placed on the market by the Gilson Slide Rule Co., Stuart, Fla., under the name of the Apex Slide Rule. This instrument is 8¼" in diameter and the length of the C Scale is 25 inches. The graduations and figures on this rule are large and clear-cut so the rule can be used for hours without eye-strain. Anyone with weak eye-sight can easily use this slide rule.

There are eleven engine-divided scales on the front side of the rule and two hair-line indicators for close reading. The long indicator always gives the answer to the problem that is being solved.

On the back side of the rule are the scales for giving sines, cosines, tangents and cotangents from 0 to 360 degrees. Also the decimal equivalent of fractions to six figures. Also a hair-line indicator for reading the functions of angles to 1 minute of arc.

The Apex, it is stated, will solve any problem that can be solved on any of the regular types of slide rules and it has a number of special scales not found on any other instrument. The Log-Log Scale is divided from 1.15 to 1,000,000 and will handle numbers larger or smaller than these limits. The Binary Scale is divided into 64ths, 32nds, 16ths, etc., so that fractions and mixed numbers can be multiplied and divided without changing them to decimals.

Fractions, decimals and millimeters

Apex Circular Calculator

can be added and subtracted and the answer read as a decimal or millimeter or to the nearest fraction. The Thread Scale gives the size drill to use for any thread from 3 to 50 per inch, either V or U.S.S.F. and the answer will be given in a decimal, fraction, millimeters or a lettered or numbered drill.

The Apex Slide Rule will handle from two to six factors at each setting. Besides solving all of the ordinary calculations, this instrument will solve quadratic equations, vectors and give any root or power of any quantity excepting the even root of —1.

Sheet Metal on Non-Metal Back

American Nickeloid Company, Peru, Ill., has developed a new type of prefinished metal sheet attached to a non-metallic backing called "Metal-Bord." This material is recommended for products such as buttons, buckles, dress ornaments, signs, advertising specialties, display devices, etc.

The advantages claimed for this combination are that it permits a lighter gauge of metal to be used and yet makes possible a rigid, strong, finished product; that it reduces costs by employing lighter metal. It is stated that the material adapts itself to blanking and shearing and other production operations.

It can be supplied in any of the prefinished metals made by American Nickeloid Company, in plain, striped and crimped patterns and in all gauges; sheet sizes up to 36 x 96 inches.

Oil-Lubricated Sleeve Bearings for Roll Necks

By J. H. HITCHCOCK
Morgan Construction Company, Worcester, Mass.

TO MEET their own demand for a durable bearing of high load capacity and low frictional characteristics which could be applied to rolling mills without seriously impairing roll neck strength, the Morgan Construction Company of Worcester, Mass., developed a few years ago, an oil-lubricated sleeve bearing. After several years of thorough investigation, this bearing was introduced to the trade in 1932 as the "Morgoil" bearing. This development is particularly interesting at present for the reason that revival of the long dormant activity in rolling mill construction has led to extensive use of this bearing. Consequently it is believed that the following brief description will be of interest.

The Morgoil bearing fundamentally is a precision-machined, fully enclosed plain bearing, flood lubricated with oil. Its paramount characteristic is the complete separation of the bearing surfaces by a continuous, unbroken film of lubricant. By virtue of this characteristic, the bearing load is supported wholly by fluid pressure within the oil film, and the only frictional resistance to motion is that imposed by fluid shear within the oil film. Consequently Morgoil bearings possess extremely high load capacity and operate indefinitely with remarkably low frictional losses.

The features of design and construction which are employed to achieve perfect fluid lubrication are illustrated in Fig. 1, together with other features of practical significance. The assembly includes a heat-treated forged alloy steel sleeve which rotates with the roll neck and which is constructed with a flange at its outer end. The cylindrical portion of the sleeve is carried in a bushing lined with centrifugally-cast bearing metal of special composition, while the thrust flange is placed between two stationary thrust rings having centrifugally-cast facings of bearing metal. These operating parts of the Morgoil bearings are produced with extreme care and are machined to very close tolerances. The outer surface of the sleeve is ground to a mirror finish, as shown in Fig. 2, and the inner surface of the bushing is bored to precision dimensions with a diamond tool. All of these highly machined parts are fully enclosed in a cast casing of electric furnace steel. Seals are provided to retain the lubricant and to exclude water and dirt.

Installation and removal of these bearings are accomplished very simply and without separation of the bearing assembly. After unscrewing the lock nut which holds the bearing in place on the roll neck, the entire assembly can be removed from the neck as a unit, and can be installed similarly on the neck of a new roll. With this construction handling of the bearings is greatly simplified and the bearing surfaces are always protected against dirt and injury.

As indicated by the foregoing description, each Morgoil bearing is capable of carrying axial thrust loads in either direction, as well as radial loads. All bearing surfaces are lubricated continuously during operation by means of oil conducted through suitable ducts in the bearing casing. Two tapped holes for oil supply and drain pipes are provided in each casing; and a simple oil circulating system, consisting essentially of a receiving tank, filter, and motor driven pump, is employed to assure an uninterrupted flow of lubricant. The lubricant required is a highly refined straight mineral oil, with viscosity suitable for the prevailing conditions of load and speed. The viscosity specified varies in different installations, but is ordinarily between 500 and 2000 seconds Saybolt at 100 deg. F.

Mirror Finish on Typical "Morgoil" Bearing Sleeve

More than half of the six hundred odd Morgoil bearings now in operation are installed in existing mills, where they have replaced either roller bearings or the conventional open-type bronze and babbitt or non-metallic bearings. Installation of these bearings in existing mills is usually quite easily accomplished, and in most cases involves very little alteration of the housing windows. In a few cases it has even been found possible to retain the existing rolls, remachining the roll necks to receive the new bearings. In every application, of course, careful analysis is required, not only of the physical dimensions but also of the operating conditions.

The installation of Morgoil bearings has been accompanied in every instance by a marked improvement in rolling practice, as compared to conditions either in the same mill prior to the installation or in identical mills which are still operating on other types of bearings. Perhaps the best known characteristic of Morgoil bearings is their economy of power. These bearings operate with a coefficient of friction comparable to that of roller bearings and in many cases even less. For this reason, in mills previously equipped with ordinary bearings, a considerable margin of power is made available for expansion of the rolling schedule, in the form of higher delivery speeds, heavier reductions or increased widths of material rolled. However, these bearings possess other characteristics which are equally important. The maintenance of perfect lubrication, by preventing metallic contact and the resulting wear of the bearing surfaces, assures durability and at the same time permits roll settings to be maintained indefinitely without adjustment. Thus the gauge of the rolled products can easily be held constant within very narrow limits, and substantial increases in yield can often be made as a result. Adequate roll neck strength is provided by virtue of the small space required for the installation of Morgoil bearings, and the hazard of neck breakage is further reduced by the elimination of roll neck heating.

The characteristics described above have been observed repeatedly in practice under a wide variety of conditions. Morgoil bearings are constructed for rolls varying in diameter from 8" to 56". They have been installed in both hot and cold two-high, three-high and four-high mills for rolling steel, and are also being used in the non-ferrous field. These bearings are fully protected by U. S. and foreign patents. The accompanying photographs illustrate typical applications.

New Extrusion Process

A new process has been developed by Sparks Processes, Inc., 35 Parkhill Avenue, Norwalk, Conn., for the extrusion of steel, alloys thereof and refractory bronzes as distinguished from the present method of rolling, hammering, pressing or drawing, with their numerous operations between the ingot and the finished elongated shape. The fundamental principle of the Sparks extrusion method is to provide a practical high-speed means of extruding into elongated shapes, a plastically worked, unworked or semi-worked solid blank. By first preworking the blank before extrusion, thereby equalizing and uni-

formly distributing the temperatures thereof, a uniform directional flow of metal is said to be produced, resulting in less pressure being needed to flow the metal freely and more completely out of the container, through the forming holes of the die.

Experience has shown that with plastic metal at different temperatures in its structure, under extrusion, pressures begin to fold and form laminations which, together with the cooling effect, stop the free extrusion flow of the metal regardless of the amount of pressure applied thereto. This result is an unextruded stub remaining in the container. The volume of it varies from 15 to 25 per cent of the blank's original length and weight. In the Sparks process this condition is overcome by using a large diameter piercer, the smaller forming section of which enters the mouth of the die and remains stationary in this position during the entire extrusion operation, thus preventing the choking of the metal in the mouth of the die and allowing it to flow freely.

The sequence of operations is as follows:

The heated plastic metal blank is quickly projected into a container and closely confined therein by closing the openings of the container. Simultaneous with the complete confinement of the blank, a high-speed piercing tool is forced through the center of the same. The piercer diameter must be not less than one-third the diameter of the extrusion chamber. As the piercer moves through the center of the blank, the metal from the hole so formed, elongates the blank and at the same time by the displacement of the hotter metal from the center of the blank, its higher temperatures are distributed into the walls of the thick-wall tube so formed by the backward flow of the metal around the piercer. Also, some of the heat from the center of the blank is radiated into surfaces of the piercer which further balances the temperatures in the walls of the so-formed tube blank. From this tube solid or tubular shapes, either singly or in multiple, are extruded in the form desired.

When extruding small rods or tubes in multiple, the metal from the thick wall hole is extruded through the forming holes in the die which are located radially around the center hole in the die. The nose or point of the piercer is projected into the center hole of the die and remains there to support the die during the entire extrusion operation.

Some of the principal advantages claimed for this new form of metal flow are as follows:

1. Pre-working of the base metal blanks before extrusion and thus balancing and equalizing the temperatures thereof.

2. By the stationary position of the enlarged piercer in relation to the die when extruding solid or tubular shapes, a freer flow of metal in the direction of the extrusion is obtained.

3. The control and prevention of the backward flow of metal which causes laminations or folding of the metal at the end of the blank when its outer surfaces have lost a considerable amount of their plasticity near the end of the extrusion operation.

4. Freer and less restricted flow of metal permits the use of lower extrusion pressures which are reflected in less pressure wear on the dies, tools or container walls.

5. Long length multi-shapes can be extruded, thus greatly increasing the production a single extrusion unit.

Trigamine

Replacing Triethanolamine in most cases, a new emulsifying base, Trigamine, has just been introduced by the Glyco Products Co., Inc., 148 Lafayette Street, New York. Trigamine is a liquid, almost water-white in color with a pleasant odor. It is somewhat more viscous than Triethanolamine and is completely soluble in water, glycols, glycerine and 50% alcohol. It is immiscible with organic solvents. It is non-hygroscopic at ordinary humidities and non-volatile up to 100° C. Trigamine forms soaps with the usual fatty acids such as stearic and oleic. Such soaps do not darken or yellow with age. Trigamine Stearate, for example, is a hard white wax-like solid which remains white over a long period of time. Trigamine Oleate is a liquid and not gelatinous. Emulsions made with Trigamine Stearate are white and stable and do not discolor even on long standing. Trigamine is less alkaline than Triethanolamine, a 10% solution in water having a pH of 9.7. Trigamine can be used as a dispersing agent for casein and shellac in water replacing alkalies and giving a much more flexible film. Emulsions made with Trigamine are of interest in polishes and many other industries.

Detailed booklet describing this product will be sent on request to the manufacturer.

New Catalogs

Everdur Metal in Various Forms: No. 1012 in rod form, includes a small amount of lead for free cutting; No. 1000 in small notched ingots, about 25 pounds each; No. 1010 basic Everdur alloy in all commercial forms; No. 1015, a modification of the basic Everdur alloy for operations requiring severe cold working. American Brass Company, Waterbury, Conn.

Micromax Electric Control; for proportioning input to demand. Leeds & Northrup Company, 4902 Stenton Avenue, Philadelphia, Pa.

Alcoa Aluminum Screw Machine Products. An extensive loose leaf catalog giving tables, technical data, etc. Aluminum Company of America, Pittsburgh, Pa.

Facts for Users of A. C. Motors. The Lincoln Electric Company, Cleveland, Ohio.

How to Cut Screw Threads and How to Grind Lathe Tool Cutter Bits; two new booklets. South Bend Lathe Works, South Bend, Ind.

Industrial Compressors and Vacuum Pumps. Catalog No. 7502-E. Ingersoll-Rand Company, 11 Broadway, New York.

Insulcrete. Light-weight insulating refractory concrete. Quigley Company, Inc., 56 W. 45th Street, New York.

Instruments for Spectrographic Analysis. Bausch & Lomb Optical Company, Rochester, N. Y.

Wet Method of Dust and Fume Collection. Catalog No. 10. Claude B. Schneible Company, 35 E. Wacker Drive, Chicago, Ill.

Rolling Grilles. Cornell Iron Works, Inc., 3600-13th Street, Long Island City, N. Y.

Fabrication and Heat Treatment of Stainless and Heat Resisting Steels: includes grinding, polishing, buffing, etc. Peter A. Frasse and Company, Inc., 17 Grand Street, New York City.

Pressuremeter; Indicating and recording, for rolling mills. United Engineering and Foundry Company, Pittsburgh, Pa.

Grinding and Finishing with Portable Equipment. Norton Company, Worcester, Mass.

Standard Hand Book of Refractories. Bulletin No. 37. Standard Fuel Engineering Company, 667 Post Avenue, S., Detroit, Mich.

Reliance Plating and Polishing Supplies. Bulletin No. 110. Covers compositions, buffs, polishing wheels, brushes, wire wheels, chemicals, metal cleaners sodium cyanide, chromic acid, anodes, chemical stoneware, dipping baskets, wooden solid shoes, respirators, rubber gloves, hydrometers, test sets, copper wire, burnishing materials, etc. Charles F. L'Hommedieu and Sons Company, 4521 Ogden Avenue, Chicago, Ill.

Tube-Turns. Catalog and Price-List No. 107; fittings, elbows, etc. Tube-Turns, Inc., 425 Fifth Street, Louisville, Ky.

Metal-Clad Switchgear. Type MI-6. General Electric Company, Schenectady, N. Y.

Cleaners. J. C. Miller Company, 528 Lake Michigan Drive, N. W., Grand Rapids, Mich.

Liquid Rouge. Matchless Metal Polish Company, 726 Bloomfield Avenue, Glen Ridge, N. J.

Metal Melting Furnaces; crucible or open flame; tilting or stationary; for die casting metal; laboratory furnace. Campbell-Hausfeld Company, Harrison, Ohio.

Industrial Cleaning and Drying Machines; washing, rinsing, slushing, drying. Industrial Washing Machine Corporation, New Brunswick, N. J.

Seamless Tubing. Bulletin No. 41. Price list and technical data. Parker Appliance Company, 17325 Euclid Avenue, Cleveland, Ohio.

Handbook of Welded Steel Tubing. Published by Formed Steel Tube Institute. Steel and Tubes, Inc., 224 E. 131st St., Cleveland, Ohio.

Cam-Lock Flanged Spindle; for rapid clamping and removal of chucks, plates and fixtures to the spindle nose. Monarch Machine Tool Company, Sidney, Ohio.

An Economist's Appraisal of Domestic Electric Refrigeration, by Dr. Warren M. Persons. Published by the Temperature Research Foundation of Kelvinator Corporation, 420 Lexington Ave., New York.

Inflation, by Leonard P. Ayres. A description of past inflations and comparison with present tendencies. Cleveland Trust Company, Cleveland, Ohio.

Mould and Core Wash Mixer. "Steeb Fasmix." Model No. 4. H. L. Steeb Company, Moline, Ill. Sold by S. Obermayer Company, 2563 W. 18th St., Chicago, Ill.

Universal Portable Riddle. Foundry Supplies Mfg. Co., 2221 Orchard St., Chicago, Ill.

Spectrometric Equipment. Bausch & Lomb Optical Co., Rochester, N. Y.

Dechema Annual, for 1935 and 1936. Complete catalog in German, French and English of the equipment, apparatus and machines and accessories exhibited at the Achema VII in Germany. The next Achema VIII, a chemical engineering show, will be held July 2-11 in Frankfort-on-Main, Germany.

Corrosion Resisting Equipment for Metal Pickling and Electroplating; tank linings and coatings; tank heating devices. Heil and Company, 3088 W. 106th Street, Cleveland, Ohio.

Lead Burning, Metal Spraying, Compound Linings. Heil and Company, 3088 W. 106th Street, Cleveland, Ohio.

Lenses; Prisms; Mirrors. Catalog D-10. Bausch and Lomb Optical Company, Rochester, N. Y.

The Spekker Photoelectric Absorptiometer. An objective "colorimeter" for use in chemical analysis. Adam Hilger Ltd., 98 Kings Road, Camden Rd., London, N. W. 1, England.

Ampliset Free-Vane Controllers. For time-temperature, flow, liquid level, pressure, time-pressure and humidity. Bulletin No. 440. Bristol Company, Bristol, Conn.

"Completeness of the Line of Abrasives"; Grinding Wheels, Sharpening Stones, etc. Norton Company, Worcester, Mass.

Udylite Plating and Polishing Equipment and Supplies. Anodes, ball and other type; plating barrels; rheostats; line switches; semi-automatic plating machines; motor generators; solvent cleaning machines; buffs; buffing compositions; polishing wheels; polishing grain; buffing and polishing lathes; special polishing machinery. The Udylite Company, 1651 E. Grand Blvd., Detroit, Mich.

Let's Talk About Pumice. An intesting folder about pumice from the ground to the consumer. James H. Rhodes & Company, 153 W. Austin Ave., Chicago, Ill.

Associations and Societies

Non-Ferrous Ingot Metal Institute

308 W. Washington Street, Chicago, Ill.

The eighth Annual Meeting of the Non-Ferrous Ingot Metal Institute was held at the Edgewater Beach Hotel, Chicago, Ill., on Wednesday, May 13. New officers were reelected as follows: President; **Benjamin Harris; I. Glueck,** vice-president; treasurer, **L. Chapman.** Executive Committee: **George H. Bangs, William J. Coane, Benjamin Lavin** and **Henry Levitt,** also the President, Vice-President and Treasurer. **R. D. T. Hollowell** was re-elected secretary-manager and **James B. Wescott** was retained as counsel.

Available information indicates that the demand for ingot brass and bronze during the past few months has been very fair. Although production is from 30 to 40 per cent below 1929 and 1930 levels, there is a growing backlog of unfilled orders.

Society for Testing Materials

260 S. Broad Street, Philadelphia, Pa.

The 39th Annual Meeting of the **American Society for Testing Materials** will be held at Chalfonte-Haddon Hall, Atlantic City, June 29-July. 3.

Among the sessions of special interest to non-ferrous metal products manufacturers are the following.

Symposium on Radiography and X-Ray Defraction Methods.

Corrosion, the Effect of Temperature, Creep.

Spectrography and Chemical Analysis.
Testing, Fatigue of Metals.
Non-Ferrous Metals, Metallography.

National Metal Show

7016 Euclid Ave., Cleveland, Ohio

Eighty-five per cent of the exhibit space in the underground exhibit hall of Cleveland's Public Auditorium, has been contracted for by exhibitors in the 18th annual **National Metal Show,** to be held October 19-23, inclusive. According to an announcement from **W. H. Eisenman,** managing director of the Show and National Secretary of the **American Society for Metals,** steps are being taken to obtain additional exhibit space.

As in past years, the **National Metal Congress** will be held in conjunction with the Show. The following societies will co-operate:

The Wire Association
Institute of Metals Division, A.I.M.E.
Iron and Steel Division, A.I.M.E.
American Welding Society
Iron and Steel Division, A.S.M.E.
Machine Shop Practice Division, A.S.M.E.
American Society for Metals.

Purchasing Agents Association

9 Park Place, New York

The **Purchasing Agents Association of New York,** had as a guest of honor at its meeting dinner on May 19, **Commissioner Russell Forbes** of the **Department of Purchase,** New York City. Another speaker at the dinner was **R. W. Phillips,** Manager, **Salvage and Reclamation Division, E. I. duPont de Nemours and Company,** Wilmington, Dela.

Personals

Palmer H. Langdon

The publishers announce the addition to **Metal Industry** staff of Palmer H. Langdon, son of the late Palmer H. Langdon, founder and for thirty-three years, editor and publisher. Mr. Langdon's duties become effective immediately following his graduation from Lehigh University where he studied metallurgy and chemistry. While there Mr. Langdon served on the staff of the "Brown and White," the college paper. During summer vacations he has been in the employ of the Lea Mfg. Co., Waterbury, Conn., in the research laboratory.

PALMER H. LANGDON

Mr. Langdon is a junior member of the A.I.M.E., a member of the Electro-Chemical Society, the A.S.M. and of Delta Upsilon fraternity.

James L. Wick, Jr.

James L. Wick, Jr., president and general manager, Falcon Bronze Co., Youngstown, O., was elected president of the American Foundrymen's Association at the annual business meeting of that organization on Thursday, May 7. This honor comes to Mr. Wick after a long career of distinguished service to the Foundry Industry and in the affairs of the A.F.A. For many years, he has been active in the cost work of the Association and has taken an active part in the affairs of the Non-Ferrous Division. Prior to his election to the presidency, he was vice president and chairman of the Divisional Activities Correlation Committee.

JAMES L. WICK, JR.

Robert L. Coe, vice president of the **Chase Companies, Inc.,** Waterbury, Conn., has been formally elected vice-president of the **Kennecott Copper Corporation**, New York. The election took place at the annual meeting of stockholders in New York City on May 5th. The **Chase Companies, Inc.,** are a subsidiary of the **Kennecott Copper Corporation. Mr. Coe,** formerly in charge of sales, will have charge of fabrication work in the future.

Louis Malkovsky has been appointed factory superintendent of the Sperry Gyroscope Company, Inc., Brooklyn, N. Y., succeeding I. H. Mills, who recently retired after many years with the company. Mr. Malkovsky has been with this company for twenty-two years.

Rudolf Neuburger has resigned as an executive of the Atlas Powder Company, to become president of United Wall Paper Factories, Inc. At one time during his connection with the Atlas company, Mr. Neuberger was director of sales of the Zapon Company, Stamford, Conn.

George O. O'Hara has joined the sales department of the Detroit Electric Furnace Co., 825 W. Elizabeth St., Detroit, Mich. Since 1930 he had been with the electrode division of Republic Carbon Co. and their successor, National Carbon Co. Before that he was with Oil Well Supply Co. and Standard Steel Works Co., in electric steel and open hearth departments. He came to the United States in 1922 from Australia where he had been connected with Broken Hill Proprietary Co.'s Iron and Steel Works.

Obituaries

Leonard Bishton-Botfield

Leonard Bishton-Botfield, President of the Botfield Refractories Company, Philadelphia, and also President of the Canadian Botfield Refractories Company, Ltd., Canada, died on May 5th at Philadelphia, age 55.

Leonard Bishton-Botfield

Mr. Botfield was affiliated with the refractories industry for many years, succeeding his father, A. Bishton-Botfield, as President of the Botfield Refractories Company in 1916. He was an outstanding figure in the refractories industry, pioneered and was responsible for numerous important developments in the manufacture of high temperature cements.

Mr. Botfield was National Chairman of the High Temperature Bonding Mortar Division of the American Refractories Institute and also a Director of the Institute.

Otto Horix

Otto Horix, president of the Horix Manufacturing Company, Pittsburgh, Pa., died at his home in that city on April 30, aged 63 years. He was general sales manager for the Bishop and Babcock Company, machinery manufacturers, in Cleveland, before he came to Pittsburgh in 1917 as president and general manager of McKenna Brass and Mfg. Company. In 1927 he formed his own company, which manufactures food packing machinery.

Warren G. Dolandson

Warren G. Dolandson, Sr., 73, former superintendent of installations for the John A. Roebling's Sons Co., Trenton, died April 5 after a long illness. He was pensioned with honorable mention by the Roebling concern in 1928 after 38 years of efficient service. He began in a field position in 1890 and later became superintendent in charge of cable installation. Mr. Dolandson was for many years prominent in the city's civic life. He was a member of the Masons and Civitan Club. His hobby was photography. Burial was in Greenwood Abbey, Trenton.—**C. A. L.**

Franklin Holcomb Loomis

Franklin Holcomb Loomis of Jackson Heights, L. I., for twenty years sales manager of the copper sheet and roofing division of the American Brass Company and a descendant of Sir Isaac Newton, died at his parents' home in

Derby, Conn., May 15. Mr. Loomis was 44 years old.

During the World War, Mr. Loomis served as second lieutenant with the 131st Regiment Field Artillery, 32nd Division and saw action at Chateau-Thierry and in the Argonne section. He was graduated from Sheffield Scientific School at Yale University in 1913 and from the Harvard School of Business Administration in 1915.

Surviving, in addition to his parents, Dr. and Mrs. Frank Newton Loomis, are his wife, two daughters, Nancy and Emma Jane, and a sister, Mrs. Nelson D. Booth of Orange, Conn.

C. U. Lamboley

While on his way home from the American Foundrymen's Association convention in Detroit, Clem U. Lamboley, 49 years old, vice president of The Brass Foundry Co., of Peoria, Ill., was stricken with a heart ailment on Saturday, May 9, and on the following day died in the Sturgis Memorial Hospital, at Sturgis, Mich.—**F. J. H.**

Metal Developments

Manufacturers, distributors, users and others interested in full disc buffing wheels will be interested to learn that the existing **Simplified Practice Recommendation R 115-30** for Full Disc **Buffing Wheels** has been reaffirmed without change by the **Standing Committee of the Industry.** This reaffirmation includes also the yardage table developed by the Committee in 1935, to supplement the recommendation. Copies can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.; price 5c.

A statement from the **International Nickel Company,** 67 Wall Street, New York, gives striking figures on the consumption of metals. The following tabulation speaks clearly for itself.

Estimated World Consumption (Short Tons)

	1929	1935	Change
Copper	2,085,000	1,800,000	13.67% Decrease
Lead	1,861,000	1,615,000	13.22% Decrease
Zinc	1,612,000	1,444,000	10.42% Decrease
Aluminum	304,000	303,000	.....
Tin	204,000	156,000	23.53% Decrease
Nickel	68,000	80,000	17.65% Increase

Estimated Per Capita Consumption in 1935 (Pounds)

	United Kingdom	United States	Canada
Copper	13.54	8.63	4.24
Lead	16.10	6.87	3.95
Zinc	9.75	7.66	2.59
Aluminum	1.43	1.62	1.06
Tin	1.07	1.14	0.45
Nickel	0.41	0.54	0.16

An aluminum wheelbarrow has been developed and marketed by the **Sheet Aluminum Corporation** of Jackson, Mich. The principle of reducing deadweight, applies with considerable force here, as the wheelbarrow can be trundled about easily by a boy of 12, even when it is loaded with such things as potted plants. For some uses a pneumatic tire is provided.

The **National Machine Tool Builders Association** has been presented the Award of the **American Trade Association Executives** for outstanding achievement of a trade association during the past three years. **Secretary of Commerce Roper,** who made the presentation, pointed out that the award was won because of the Association's helpful work, not only to the machine tool and related industries, but also to the general public, chiefly through the courageous staging of the Machine Tool Show in Cleveland last Fall.

The **Annual May Lecture** of the **Institute of Metals** (Great Britain) was delivered by **C. C. Paterson,** director of **Research Laboratories** of the **General Electric Company Ltd.,** Wembley, England, on Wednesday May 6, in London. The subject was **"The Escape of Electricity from Metals: Its Practical Consequences."**

The **Midwest Welding Conference** was held June 4-6, at 2211 W. Pershing Road, Chicago, Ill. A number of authorities on arc welding, gas welding, and gas cutting, gave talks on recent developments in their respective fields. Demonstrations were held and also exhibits of welding machines, rods, etc. The conference was sponsored by the **Hollup Corporation,** Chicago, Ill., in co-operation with several companies, including **American Brass Company** of Waterbury, Conn.

Among the subjects discussed were the following:

Welding Nickel, Monel Metal and Inconel, by **F. G. Flocke,** International Nickel Company, 67 Wall Street, New York.

Application of Bronze Welding and Brazing to Railroad Shops, by **Homer Gannett,** C. B. & Q. R. R.

"Phos-Copper," by **E. A. Randall,** Burdett Oxygen & Hydrogen Company.

The **Ford Motor Company** at the Rouge plant at Dearborn, Mich, has completed building of a new chemical and metallurgical testing and production control laboratory, which it is stated, is one of the most modern industrial laboratories in the United States. It includes equipment for chemical analysis, physical testing, X-ray inspection and metallography and is manned by a staff of 65 technicians working in shifts, to keep accurate check on the materials as they are used and produced in the plant. R. H. McCarroll is in charge.

Production of **metallic cadmium** in the United States amounted to 3,477,091 pounds, an increase of 25 per cent over 1934, and the largest annual production ever recorded. Actual sales amounted to an all-time high record of 4,023,900 pounds, an increase of 63 per cent over 1934. Imports of cadmium into the United States in 1935 amounted to 185,387 pounds, coming from Belgium, Norway, France, United Kingdom, Canada and Netherlands.

Chemicals used in wood preservation, in industry and in agriculture along with a complete miniature **metal finishing plant** will comprise the exhibit of the **Grasselli Chemical Company** at the Great Lakes Exposition, which opens in Cleveland, Ohio, June 27 and continues until October 4. The Grasselli exhibit will cover 886 sq. ft. of space and will be located in the Lakeside Exposition Hall.

A new **chromium plating process** has been granted a patent in Austria, No. 141,851, covering a solution which uses sodium oxide as the electrolyte. Among the claims are: higher current efficiency; softer and brighter finish; more ductility.

Corporation Earnings

Net Profit Unless Followed by (L) Which is Loss

	First Quarter 1936	1935
Anaconda Copper Mining Company	$2,808,320	$2,350,721
Chapman Valve Mfg. Company	53,118	27,212
Cleveland Graphite Bronze Company	318,456	547,917
International Nickel Company	8,386,787	4,917,627
Reynolds Metals Company	317,674	287,962
United States Foil Company (Year 1935)	521,592	(1934) 502,581
Vulcan Detinning Company	60,994	66,191
Waterbury Clock Company (Year 1935)	43,836	(1934) 127,278

Special Metal Finishes Exhibit

In this second exhibit of metal finishes, an attempt has been made to group all the various products under types of finishes rather than by manufacturing company as was the case in our previous exhibit. Nearly all methods of finishing of metal are illustrated by the samples and panels, and also various products for which a particular finish in question may be adapted.

Polishing

Many different base metals such as copper, brass and stainless steel are permanently finished by polishing without the application of any plate or coating. Samples in this polishing section include scratch brush or satin finish on copper and bronze, high polish on brass, Everdur Ambrac, cupro-nickel, nickel silver, aluminum, sterling silver, and stainless steel. The different products in this division include extruded pilaster sections, molding sections, flat ware, decorative boxes and containers.

Porcelain Enamel

An analysis of porcelain enamel has been made on poster form as a background for the exhibit in this section. This includes a map showing the origin of each material used in the frit from which enamel coatings are made. It also includes a description of the process of finishing with porcelain enamel and photographs of typical equipment and operations. Samples of different designs and colors on ingot iron form a large part of the exhibit. An interesting panel shows the method of applying first the dark ground coat, then the first cover coat, and, finally the finish coat. This process calls for three fires.

Plating

A large part of the exhibit is devoted to various types of plating. These include rhodium on brass, rhodium on silver, chromium on die castings and chromium on cast brass. Various electroplates using cyanides in solution are shown. These include silver, gold and copper and some novelties such as a marble effect. One interesting sample of plating is an anaesthitizing machine, where, in one unit, zinc die castings, steel and other metals are first plated with nickel and then with chromium. A series of reflectors for commercial use, a large one for aviation for an airplane beacon, illustrates the application of rhodium plate, which gives the highest reflectivity value in a practical plate. Other plates shown include cadmium, bright nickel, gold and bronze copper. The bond between various plates and metals is illustrated by several mistreatment tests showing, for instance, how a syphon head resists hammer blows.

On one table there is arranged an assortment of products illustrating different types of plating. This includes a silver plated tray and coffee set, a silver plated urn on a nickel silver base, several copper plates on zinc base slush casting metal, and various chemical finishes on copper and brass.

One panel is devoted to cadmium plating and a group of interesting products illustrates plating on glass, plastics and other non-conductors.

Chemical Coloring

Two methods of coloring plated products are illustrated. One shows the chemical treatment of the surfaces after plating and the other shows novelty plating in colored effects. Under this last group are included chemical verde green, antique bronze, English antique brass and other finishes. Bronzes in various colors and an interesting blue are shown as samples of finish by chemical treatment.

Aluminum Coloring

Anodizing and coloring of aluminum is well illustrated in one section of the exhibit. Panels showing different colors and different processes are displayed. Products include anodized cylinders, black finished tumblers, decorated drawn aluminum tubing and extruded sections. Other panels show many novelty effects on aluminum.

Lacquer Finishes

Most of the standard forms of lacquer with a large variety of colors are exhibited on smaller panels, and a series of crackle, veiling and novelties in finishes are shown in many colors and effects. The products include building hardware and instrument cases with clear lacquer and colored lacquers.

Metal Spraying

Steel bolts, zinc coated by a metal spray gun for protection, form part of this exhibit which includes lead, bronze, and aluminum spraying on steel, brass and wood.

Future Plans

Plans for the further development of this exhibit call for decorative posters typifying and describing the various kinds of finish. Included on these will be descriptions of processes and of the possibilities in each group.

Business Items-Verified

Atlas Manufacturing Company, Fostoria, Ohio, manufacturer of automobile equipment, affiliated with Hupp Motor Car Corporation, Detroit, has taken over the plant of the parent organization at Fostoria. This firm operates the following departments: tool room, polishing, and grinding room.

Storage building of the **Huntington Stove and Foundry Company,** E. Huntington, W. Va., was damaged by fire recently, but expects to be in operation with new plant June first. This firm operates the following departments: aluminum foundry, brazing, plating, polishing and grinding room.

Carl Stenberg recently has moved his foundry, operated as **Stenberg's Foundry,** to larger quarters at 4228 Whiteside Avenue, Los Angeles, Calif. New equipment has been installed. The foundry produces bearing metal, brass, bronze and aluminum castings, match plates and metal patterns.

Carl Mayer Corporation, 3030 Euclid Avenue, Cleveland, Ohio, has been organized to manufacture a complete line of industrial ovens and drawing and tempering furnaces. **Carl Mayer,** president, was formerly with **Smith-Mayer Corporation,** oven and furnace builders, dissolved. **C. A. Vining** is vice-president.

Charles H. Proctor is organizing the **Proctor-Bond Chemical Company** in Clearwater, Fla. They will exploit the Parador chemical products. The plant will be located on East Street, Clearwater.

International Silver Company, Meriden, Conn., has sold its Factory B on Bridge Street, Derby, Conn., to the **De-Jur-Amsco Corporation,** Shelton, Conn.

At a meeting of directors of the **Doehler Die Casting Company,** Toledo, Ohio, the following were elected: **H. H. Doehler,** formerly president was elected chairman of the board; **F. J. Koegler,** formerly first vice-president and treasurer was elected president. **L. H. Pillion** was elected executive vice-president; **R. Bernhard** was elected treasurer and **F. Knoebel** was elected secretary.

Lewis Roe Mfg. Co. who have been located since 1921 at 1050 DeKalb Ave., Brooklyn, N. Y., have opened a New York office and salesroom at 86 Walker St., New York City. Besides manufacturing polishing lathes, pieced buffs and plating tanks, they are also jobbers in polishing and plating supplies and will carry a complete line of the above material at the New York branch. The several sizes polishing lathes that they manufacture will be set up for demonstration purposes.

Waukesha Foundry Company, Waukesha, Wisc., has leased adjacent plant, 100 x 150 ft. from I. B. Rowell Company, for bronze casting production, and will devote its own shop, 110 x 225 ft., exclusively to nickel-alloy and aluminum castings. Products go largely into food industries. This firm operates the fol-

lowing departments: bronze, brass and aluminum foundry; brass machine shop, casting shop.

Seth Thomas Clock Company, Thomaston, Conn., will make renovations in their plant for the installation of machinery and equipment from the recently acquired Stromberg Electric Company of Chicago, late in the Fall.

Inland Division, General Motors Corporation, Dayton, Ohio, is making plans for building additions as a part of their planning for the future. Nothing definite, with reference to any expansion has been decided, and they have nothing to announce at this time.

The **Advertising Department** of **Bakelite Corporation** has moved its offices from Bound Brook, N. J., to 247 Park Avenue, New York. All communications addressed to Allan Brown, Robert J. Barbour, Don Masson, should be mailed to new address.

Exolon Company, Blasdell, N. Y., have made **MacDermid Inc.,** Waterbury, Conn., representative for their line of abrasive products in New England.

MacFarland Mfg. Company, Inc., and their associated company, the **Jackson Buff Corporation,** 21-03 41st Ave., L. I. City, N. Y., who have recently developed several new lines of buffs are featuring particularly their newest development, the Airway Ventilated Buff which will be distributed by the **MacDermid Inc.,** of Waterbury, Conn., throughout New England.

Dearborn Brass Company, 805 B Avenue, N. W., Cedar Rapids, Iowa, manufacturer of plumbers' brass goods, has let general contract for one-story addition, 40 x 110 ft., to be used primarily for storage and distribution. The firm operates the following departments: bronze, brass and aluminum foundry; brass machine shop, tool room, stamping, soldering, plating and polishing.

Industrial Washing Machine Corporation, New Brunswick, N. J., has been formed to manufacture washing, rinsing and drying machines for the metal industry and equipment for bakeries, Ryan Sadwith, president, announced. Mr. Sadwith is vice-president of Ross Industries Corporation. H. H. Ball, secretary, is in charge of designing equipment and of sales. The company operates a stamping department.

Bridgeport Thermostat Company, Bridgeport, Conn., recently organized with capital of $750,000 has acquired thermostat and bellows division of Bridgeport Brass Company, and will take immediate possession, operating as an independent unit. Temporarily, plant will be continued at present location. New company has purchased the plant formerly occupied by the Connecticut Electric Mfg. Company, 1225 Connecticut Avenue, Bridgeport, and is equipping that plant for operation at earliest possible date, giving employment to about 500 persons. New works will specialize in production of temperature control equipment and parts for electrical refrigeration, heating equipment, automobiles, etc. W. F. Macdonald and W. J. Von Harten head new company.

The **Claude B. Schneible Company,** Chicago, Ill., engineers and builders of dust and fume suppression equipment sold under the trade-name "Multi-Wash" have recently enlarged their sales facilities. They announce the addition of the following sales representatives: Parry Engineering Company, 154 Nassau Street, New York City, N. Y.; Ferdinand G. Schultz, 215 Questend Ave., Pittsburgh, Pa.; Grant & Company, 2144 E. Seventh St., Los Angeles, Calif.; Pacific Graphite Works, 40th & Linden Sts., Oakland, Calif.; Carl F. Miller & Company, 228 W. Pacific Ave., Spokane, Washington.

Ferro Enamel Corporation, Cleveland, Ohio, announces a Forum, to be held for porcelain enamelers beginning July 23. This will last for three days and will be devoted to instructions and discussions on general shop practice. A special Forum for Kitchenware enamelers will be held on July 17 and 18. Classes will be held in Cleveland, Ohio, at the Company's plant, and the instructor will be **J. E. Hansen** assisted by associates of the Ferro Company and well known members of the Porcelain Enameling Industry. This is the Tenth Annual Forum to be held by the Ferro Enamel Corporation.

The recent change in the location of the Western plant and General Offices of the **Apollo Metal Works** from La Salle, Ill., to Clearing Industrial District, Chicago was followed by the announcement, on May 12th, that suit has been entered by the Apollo Company against the city of La Salle for damages amounting to $360,000 that developed out of an alleged riot at its La Salle plant on May 17, 1935.

Metal Treating, Inc., Milwaukee, Wisc., has been organized by Clarence F. Graham, 3259 N. 36th Street, formerly associated with the Koehring Company, Foundry Sales Division, Milwaukee. Harvey Semrow is associated with Mr. Graham. The firm is now in operation and is equipped to handle the heat treatment and testing of all metals, and is located at 1571 W. Pierce Street.

Detroit Vapor Stove Division, Borg-Warner Corporation, 12345 Kercheval Avenue, Detroit, Mich., manufacturer of gas and electric ranges, has let contract for a one-story addition for general shop, storage and distribution. Cost over $40,000 with equipment.

Chicago Electric Mfg. Company, 2801 S. Halsted Street, Chicago, Ill., manufacturer of small motors, parts and other electrical products has approved plans for new one-story plant, 160 x 500 ft., in Clearing Industrial District. Completion is scheduled early in July, when present works will be removed to new location and capacity increased. Cost about $250,000, with equipment. The following departments are operated: tool room, stamping, soldering, plating, polishing grinding room, lacquering, japanning.

Charles W. Hardy, formerly works manager of the Casper Lowenstein Division, United-Carr Fastener Co., 83 Roebling Street, Brooklyn, N. Y., has established an office as an industrial consultant at 103 Park Avenue, New York. Mr. Hardy is prepared to advise on plant location, factory layout, organization, automatic equipment, quality improvement, production increase, wage methods, cost reduction and purchasing procedure.

Kelvinator Corporation, Detroit, Mich., announces the establishment of a new division called, **"Kelvin Homes."** These houses will be designed to sell at prices within easy reach of families of moderate income.

Charles Paeschke Jr., vice-president and secretary of the **Gueder, Paeschke and Frey Company,** Milwaukee, Wisc., has been elected president of the company to succeed **Frank J. Frey, Sr.,** who becomes chairman of the board. **Frank J. Frey, Jr.,** has been elected executive vice-president and treasurer; **Henry V. Millmann,** vice-president in charge of production; **Carl H. Voss,** vice-president in charge of sales; **John F. Harmon,** secretary, and **A. J. Chamberlain,** manager of the steel package division. The following departments are operated: tool room, spinning, stamping, tinning, soldering, japanning and enameling.

D. M. Curry of the International Nickel Company, 67 Wall Street, New York, addressed the St. Louis Chapter of the American Foundrymen's Association on May 14, on modern nonferrous foundry practice. The discussion outlined methods of producing sound castings in brass, bronze, aluminum, Monel metal and nickel silver, with special emphasis on the proper sand control.

Agate Lacquer Mfg. Company, Inc., 11-13 43rd Road, Long Island City, N. Y., cordially invite the trade to look over the specimens on permanent display at Metal Products Exhibits, 630-5th Avenue, New York. Among the articles exhibited are the following:

Bronze finished with lacquer for outdoor use.

Gold plated plates: original metals are of nickel silver, brass and white metal. These are lacquered with a particular type of material which is said to be most durable and lasting.

Brass ornaments coated wth dye and lacquer—thus imitating a 14K gold plate.

Dresser sets, some of copper and silver, finished with the same durable lacquer mentioned above, and the others bear a reproduction of a cloisonne effect. This finish is obtained wth Agateen buffing lacquer.

Etched specimens, finished with buffing lacquer and some with an elastic lacquer, allowing articles to be blanked and formed after articles were lacquered. The buffed samples were plated after lacquering.

The **Casper Lowenstein Division, United-Carr Fastener Co.,** 83 Roebling St., Brooklyn, N. Y., has been moved to the main plant of the United-Carr Co., Cambridge, Mass.

News From Metal Industry Correspondents

New England States

Waterbury, Conn.

May 29, 1936.

Every index of business showed an increase for April over March, and over April last year, according to the **Chamber of Commerce.** For the past several months while increases have been shown over the previous year there was a falling off compared to the previous month.

The number of employees in concerns employing 65 or more was 31,935 in April, an increase of 36 over March. In the eight largest factories the number was 17,133, an increase of 95 over March and of 2,086 over April last year. Bank clearings were $6,228,300, an increase of $705,600 over March and of $1,467,600 over April last year. Over 12,819,000 KWH of electricity were consumed an increase of 64,209 over March and of 1,442,567 over April last year.

The **Risdon Mfg. Co.** has absorbed most of the **Smith & Griggs Mfg. Co.** of this city. The **Risdon Co.** has bought part of the land and buildings and leased the rest with an option to buy in five years. The local plant has been running on a small scale lately and employing less than 100. The **Risdon Co.** plans to increase the number to nearly 500. The local plant has manufactured buckles, clasps, auto hardware and other brass and metal goods. The **Risdon Co.** manufactures automobile specialties, metal accessories for safety pictures and moving picture cameras and other metal goods. The **Smith & Griggs Co.** was formed in 1869 by **John E. Smith** and **Henry C. Griggs** and its capital stock is $400,000. Its president is **David C. Griggs** and secretary and treasurer is **Robert J. Eggleton. Lewis Dibble** is president and general manager of the **Risdon Co.**

Robert L. Coe, vice president and general sales manager of the **Chase Companies, Inc.,** was elected a director of the **Kennecott Copper Co.** last month.

C. H. Granger, superintendent of the **Waterbury Clock Co.** denies that a general lay-off of help is taking place but that the seasonal slump has made necessary the shortening of hours in some departments. The watch business, he said, is holding to what has been regarded as normal for some time, except for the seasonal slump.

—W. R. B.

Connecticut Notes

May 29, 1936.

HARTFORD—Employment in the 43 plants in this city increased 462 to a total of 25,905 during April as compared to the previous month. Man hours increased 1,147,977 to a total of 4,267,730. The large increase was because of the shutdown in March due to the flood.

Hamilton Standard Propeller Co. has plans for an addition of 100,000 square feet of floor space.

BRIDGEPORT — The **Bridgeport Brass Co.** reports earnings for the first quarter of $194,343 compared with $195,408 for the same period last year.

Average weekly payrolls in this city in April were $975,932, a gain of 9 per cent over April last year, but a little less than March of this year. Bank clearings were $7,880,405, or 10 per cent higher than a year ago.

NEW HAVEN — The **Winchester Repeating Arms Co.** has purchased the **Bond Electric Corp.** of Jersey City, N. J. and will move the business to this city. It is expected to give additional employment to 500 persons.

DERBY—The **International Silver Co.** of Meriden has sold its local plant on Bridge Street to the **De Jur-Amsco Corp.** of Shelton. It is understood the latter concern has been formed only recently. It has a sales office in New York City. The sale price has not been divulged.

NEW BRITAIN—Investigators of the **U. S. Department of Labor** are investigating strikes in the **B & K** plant of **Landers, Frary & Clark** and at the **Stanley Works.** In the former plant 200 men, members of an independent union, walked out in protest against the discharge of a fellow workman. The controversy at the Stanley Works was over whether the factory officials had refused to discuss conditions with the union. It was reported the officials said they would talk with members of a shop committee but not with an outside organizer.

Edward Wasielewski was arrested last month charged with thefts of tin from the **Landers, Frary & Clark** plant. He was employed at the plant and is accused of taking out a cake of tin worth $25 almost every day on leaving work. More than 500 pounds are alleged to have been stolen.

Twenty-one plants in the city report an increase of 19 employees in April compared with March and an increase of 9,956 working hours.

BRISTOL—Twelve local plants report a decrease of 81 employees in April but an increase of 4,192 man hours.

THOMASTON—**Smith W. Ferguson,** vice president of the **General Time Instruments Corp.,** owner of the **Seth Thomas Clock Co.** of this town, appeared before the Senate finance committee May 4 to protest a section of the new tax bill which, he said, subjects the parent company to penalty taxes in its endeavors to aid the **Seth Thomas Clock Co.** by giving it some of the earnings of the holding company. He said that while the market for alarm clocks and low grade clocks and non-jeweled watches is fairly good the market for the high grade clocks manufactured by the local company has been practically non-existent recently.

NORWALK — The **Segal Lock & Hardware Co.** reported unfilled orders on April 1 were $401,608 more than on the same date last year.

MIDDLETOWN—The **Russell Mfg. Co.** has closed its plant at Rockfall and is concentrating all operations here. Modern machinery is being installed, particularly in the grinding department of the automobile division which has increased its production.

SOUTHINGTON—The six principal plants in this town showed a decrease of 14,346 man hours in April.

—W. R. B.

Providence, R. I.

May 29, 1936.

Payrolls in manufacturing industries throughout Rhode Island during the month of April averaged seven per cent higher than during the corresponding month last year, according to the statistics released a few days ago by the **Brown Bureau of Business Research.** The non-ferrous metals showed one of the largest gains, its increase being 13.2 per cent over the figures for the preceding month, and 50.7 per cent over that of April last year. On the other hand the jewelry and silverware industries were 6.6 per cent behind the preceding month, although only 4.0 per cent lower than for the corresponding month of 1935. The total disbursements of all manufacturing industries of the State for the month of April was $8,888,212; non-ferrous, $220,004 and jewelry and silverware, $774,045.

Articles of association have been granted to **Samson Nathanson,** of Central Falls; **Christine M. Nanni of** Providence and **Virginia W. Allen** of West Warwick to conduct a manufacturing jewelry business in Providence in accordance with the laws of Rhode Island, under the name of the **Howard Jewelry Company.** The authorized capital consists of 120 shares of common stock of no par value.

The manufacturing business conducted at 220 Eddy Street under the style of **Max Deutz,** is owned by **Olga T. Deutz,** of 533 Hope Street, according to information filed at City Hall.

The American Plating Company, 230 Eddy Street, Providence, is owned and conducted by **Ashian Jerjorian** of 111 Wheeler Avenue, Cranston.

The American Brass Company, 131 Dorrance Street, has purchased a considerable tract of land with buildings thereon, at Chestnut, Elm and Tallman Streets for future expansion and development. Architects' plans are being drawn and it is planned to start build-

ing at an early date. More ample stock room, better shipping facilities and more modern office accommodations will feature the new building.

The Unique Jewelry Manufacturing Company, Inc., has been incorporated under the laws of Rhode Island to conduct a manufacturing jewelry business in Providence with an authorized capital consisting of three shares of common stock of no given par value. The incorporators are: **Eugene J. Sullivan, Jr., Hyman Lisker** and **Marguerite Loehning,** all of Providence.

—**W. H. M.**

Middle Atlantic

Utica, N. Y.

May 29, 1936.

A gradual increase in the percentage of employment in Utica in the metal trades is noted in a recent report of the Industrial Association of Utica which shows a 3.9 per cent increase in employment in March over the preceding month.

To take care of increased orders the **American Emblem Company,** New Hartford, N. Y., manufacturers of novelties made from copper, chromium and nickel have leased additional space outside their own factory. The company officers report a steady climb in business.

The portable typewriter factory of the **Remington Rand Inc.** is to be moved from Syracuse to Ilion near Utica according to a statement of company officials. **J E. Straub,** superintendent of the Syracuse plant, made the announcement after approximately 1,500 men and women walked out as a result of a disagreement with the management. An announcement was made in Ilion May 22 that the Ilion unions will not oppose the shift.

Labor leaders announced that the shift involved more than the Syracuse and Ilion plants and a conference was scheduled in New York at which union officials, federal labor conciliators and plant officials planned to attend late in May.

A slight increase in the number employed in the metal trades in this area was noted by the Industrial Association during April.

The name of **"Rogers"** on silverware which has been litigated for many years in numerous courts is the subject of an opinion filed by **Judge Frank Cooper** in the United States District Court in Utica in April. The court refuses to dismiss a suit brought by the **International Silver Company** to restrain **John G. Myers Co., Inc.,** Albany, from selling and advertising **"Rogers"** silverware without designating that it was made by **Oneida Community Ltd.** At the same time Judge Cooper refuses to grant the **Rhode Island Company** a temporary injunction restraining the defendant from alleged unfair competition in the sale of **Oneida** silverware as "Rogers." The court points out that the action now may soon be tried.

—**E. K. B.**

Newark, N. J.

May 29, 1936.

The **Geza Muller Sheet Metal Co.,** for some years located at 36 Oxford Street, has leased several thousand feet of space in a building on St. Francis Street because of the increase in the concern's business.

Sale of the Monmouth Junction, N. J., plant of the **Consolidated Chemical Corp.** to the **Magnetic Pigment Co.,** of New York for $30,000 has been confirmed by **Federal Judge Forman.** The offer for the sale was made to the Court by **Kenneth Robbie,** receiver.

Bakelite Corp., 247 Park Avenue, New York, has let a contract for a plant addition at Bound Brook, N. J. to cost $37,000 with equipment.

Following Newark concerns have been incorporated: **Radio Wire & Cable Co.,** 1,000 shares, no par; **Polar Co.,** insulating specialties, $65,000 preferred and $60,000 common; **Mech-Chemical Engineering, Inc.,** chemicals, 1,250 shares Class A, 1,250 shares Class B, no par.—**C. A. L.**

Trenton, N. J.

May 29, 1936.

A revision of rates and rating practices affecting workmens' compensation insurance policies, estimated to save New Jersey about $400,000 on an annual basis, has been announced by the State banking department. The rates will be effective on policies renewed or issued after June 30. It is said that the decrease would be about 3 per cent on the average policy in classifications in which there had been fewer accidents. Insurance in three industrial classifications will increase slightly because of more accidents in these classifications. The new rates will be effective only slightly six months.

The **John A. Roebling's Sons Company** recently described on the radio the spinning of the cables on the new Golden Gate Bridge at San Francisco, direct from the bridge. Microphones were installed on the catwalk of the bridge. All the wire used in the cables of the huge span were made by the Roebling Company, which also built the bridge anchorages.—**C. A. L.**

Middle Western States

Toledo, Ohio

May 29, 1936.

Manufacturing in this area has been holding steady and at a high point for the last several months. Recently, however, there have been indications of a possible slow-up for the summer period. No one, however, believes that this will continue for any length of time, as it is generally understood that the motor car industry will resume its fall operations much earlier than in other years.

The accessory plants continue quite active. This also applies to the plating plants which are not all dependent on the motor car for regulation of production.—**F. J. H.**

Detroit, Mich.

May 29, 1936.

Manufacturing conditions, particularly in the automobile industry, have slowed up to some extent during the last few weeks. This is not alarming from a recovery standpoint, as it is something that always happens at this time of the year and indicates that this area will pass through its usual summer moderation in production and business in general. Indications are, however, that the decline will not be nearly so pronounced as it has been in previous summer periods.

The accessory plants naturally are showing the same trend, so far as production is concerned. They still, however, are making a fair showing. The plating plants up to the present time have been extremely active. They also are showing signs of tapering off in production.

There seems to be no seasonal period with the manufacturers of refrigerators and air conditioning plants. Most of them have been operating to capacity over a long period.

The **Lakey Foundry & Machine Co.** has recently started production on a new release of 250 cylinder heads daily for the **Chevrolet Motors,** according to **F. E. Cook,** treasurer. The heads, it is stated, are being shipped to the **Warner Gear Division** of the **Borg-Warner Corp.,** for machining. The **Lakey** plant has just completed a contract for 2,800 units of the same model, it is stated.

Announcement is made that the **Aluminum Industries, Inc.,** at Cincinnati, has received an aluminum piston contract from the **Ford Motor Co.,** of sufficient proportions to keep the company's foundry department operating at or close to capacity for the remainder of the year.

Wallace Zwiener was recently elected president of the **Hupp Motor Car Corp. Mr. Zwiener** has served the corporation as treasurer for some time and will continue in that capacity as well as president.

David E. Anderson, chief engineer of the **Bohn Aluminum and Brass Corp.,** Detroit, whose organization supplies many parts for the engines in the airplanes manufactured by the **Arrow Aircraft and Motors Corp.,** at Lincoln, Nebraska, pointed out the versatility of their power plant which is not only found in so many automobiles but which also won the world's 225-class power boat championship at Toronto a year ago and now rounds out its triumphs with a signal success in the air. Tests of the Arrow airplane were recently held in Detroit and were watched with interest by **Ford Motor Company** officials.—**F. J. H.**

Pacific States

Los Angeles, California

May 25, 1936.

The making of automobiles in this city now amounts to $50,000,000 a year. What is practically a new industry is the making of house trailers, of which the output the current year will be $1,000,000.

The **Studebaker Corporation** which recently spent $1,000,000 for a plant here, at 4530 Loma Vista Ave., with 107,000 square feet of space, have now decided to double the size of the plant, which will cost another $1,000,000.

Sterling Electric Motors, Telegraph Ave. and Atlantic Blvd., are now making a new vari-speed electric motor.

The **Salm Mfg. Co.** of Torrance, have gone actively into the making of metal specialties for fishing.

Harry A. Ungar, 7914 North Mariposa is making an electric pencil, for writing or marking on steel, brass or other metals.

The **American Brass & Aluminum Co.** of 2412 Santa Fe Ave., are enlarging their foundry.

Louis Simon has bought the **Ace Washing Machine Co.** factory at 2517 Whittier Blvd., and the Ace Wringer Roll Co. All parts will be made there.

The **Alert Lamp & Shade Co.** have moved to 309 East 8th St. and will enlarge the plant.

F. N. Wood has started in business, plating and polishing, at 804 East Florence Ave.

The firms who have put on exhibit at the San Diego Exposition, are the following: **Payne Furnace & Supply Co.; Day & Night Water Heater Co.; National Heating & Engineering Co.; Pacific Gas Radiator Co.;** American **Stove Co.; James Graham Mfg. Co.; Gaffers & Sattler; O'Keeff-Merritt Co.; George D. Roper Corp.; Tappan Stove Co.; Electrolux Corp.** and **San Diego Gas & Electric Corp.,** all firms making air conditioning apparatus.

The **Ward Refrigerator Mfg. Co.,** at 6501 South Alameda Ave., are enlarging the plant for making refrigerators.

The **United Jewelry & Mfg. Co.** have started to enlarge their factory at 220 West 5th St.

The **S & M Lamp Co.,** at 36th St. & Broadway, are now manufacturing a new automobile lamp.

The **California Metal Arts Co.** of 1825 West 7th St., have originated and are manufacturing aluminum ware, finished to resemble silverware and are enlarging their plant.—H. S.

Metal Market Review

May 29, 1936.

Copper was steady and firm throughout the month at 9.50c per pound for electrolytic. Sales were only 3,350 tons the first week; 3,745 the second; 4,600 during the third, and 2,600 for the fourth; a very slow month, of course, to make up for the heavy buying which had taken place in April to beat the price rise.

World's stock of refined copper decreased by over 12,000 tons during April and domestic stocks by 4,777 tons.

Zinc was unmoved at 4.90c per pound, Prime Western E. St. Louis. Sales were moderate but the tone was steady. Domestic shipments of zinc to consumers during the first four months of 1936 totalled 166,856 tons against 149,956 for the same period of 1935. The metal closed the month fairly firm.

Tin see-sawed within a narrow range, beginning at 47c per pound Straits, dropping as low as 45.75c during the third week and ending the month under 45. Trading was fair to dull throughout but ended very weak.

The International Tin Committee decided to defer the determination of tin quotas until its meeting on June 25th.

Lead was another quiet performer remaining at 4.45c per pound, E. St. Louis. The demand was good during the first week, slackened during the next, improved slightly in the third and continued the improvement toward the close. Battery and pigment manufacturers were the largest buyers. Refined lead statistics for April showed a reduction in stocks on hand of 2,397 tons.

Silver kept to its staid and "respectable" ways, spending the first two weeks at 44.75c per ounce. During the third week it stepped up to 45.375, but evidently found the air a little thin at that level, and returned after a couple of days to its former ledge at 44.75c. On May 18 an announcement was made in Washington that an agreement on silver, satisfactory to China and the United States, had been reached. Under this plan, the United States will purchase substantial amounts of Chinese silver at world market quotations. This announcement, undoubtedly, caused the small rise which was later lost.

During the first three months of 1936, the United States produced 14,759,000 ounces against 9,083,000 in 1935.

Intake of **copper scrap** by the refineries increased considerably, the offerings growing to such an extent that during the third week, copper refiners reduced their bids from 7½ to 15 points. The total intake was probably about 18,500 tons, the highest in a number of years. Premiums were still offered, however, for large lots.

Ingot Brass and **Aluminum** put in a dull month. After some hesitation and slow business, secondary ingot prices were shaded during the third week and the month closed with business quiet.

Average prices per pound received by its membership of the Non-Ferrous Ingot Metal Institute on commercial grades of six principal mixtures of ingot brass during the twenty-eight day period ending May 15 were:

80-10-10 (1½ Imp.)	10.944c
78% Metal	8.566c
81% Metal	8.760c
83% Metal	9.008c
85-5-5-5	9.320c
No. 1 Yellow Brass	7.564c

On May 1, unfilled orders for brass and bronze ingots and billets on the books of the members amounted to a total of 22,238 net tons.

The combined deliveries of brass and bronze ingots and billets by the members for the month of April, 1936, amounted to a total of 6,012 tons.

Deliveries, month by month, since 1932 have been as follows:

	1933	1934	1935	1936	
Jan.	1,261	4,053	5,338	5,948	
Feb.	1,421	4,322	4,959	5,645	
Mar.	1,586	5,291	5,014	5,897	
Apr.	2,274	5,223	5,698	6,012	
May	3,804	5,143	4,620		
June	4,973	4,941	4,111		
July	5,601	4,317	4,507		
Aug.	5,027	3,757	5,297		
Sept.	4,386	3,260	5,195		
Oct.	3,764	4,106	6,294		
Nov.	2,663	3,919	5,944		
Dec.	2,145	3,688	5,894		
Total	38,905	52,020	62,871	17,490	
Aver.	3,242	4,335	5,239	5,830	

The **Wrought Metal** Industry operated rather well. A press report estimated that the fabricators are now working at about 60 per cent of 1929 capacity. Another report (in the trade) estimated that the Naugatuck Valley is running about 80 to 85 per cent of the 1929 rate. The Scovill Manufacturing Company reports that they are not as busy to-day as they were in December, but that prospects are good.

Distribution in the Metropolitan District for May is estimated at 20% over April, and 30% to 35% over May 1935.

Average Prices for Metals	April
Copper c/lb. Duty 4 c/lb.	
Lake (del. Conn. Producers' Prices)	9.462
Electrolytic (del. Conn. Producers' Prices)	9.400
Casting (f.o.b. ref.)	9.092
Zinc (f.o.b. E. St. Louis) c/lb. Duty 1¾ c/lb.	
Prime Western (for Brass Special add 0.05)	4.90
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	46.943
Lead (f.o.b. St. L.) c/lb. Duty 2⅛ c/lb.	4.450
Aluminum c/lb. Duty 4 c/lb.	20.500
Nickel c/lb. Duty 3 c/lb. Electrolytic 99.9%	35.00
Antimony (Ch. 99%) c/lb. Duty 2 c/lb.	13.500
Silver c/oz. Troy, Duty Free	44.900
Platinum $/oz. Troy, Duty Free	31.405
Gold—Official U. S. Treasury Price $/oz. Troy	35.00

Metal Prices, May 29, 1936

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 9.625, Electrolytic, 9.50, Casting, 9.20.
Zinc: Prime Western, 4.90. Brass Special, 5.00.
Tin: Straits 44.75.
Lead: 4.45. **Aluminum,** 19-22. **Antimony,** 13.50.
Nickel: Shot, 36. Elec., 35.

Quicksilver: Flasks, 75 lbs., $75.00. **Bismuth,** $1.00. **Cadmium,** $1.05. **Silver,** Troy oz., official price, N. Y., June 3, 44.75c. **Gold:** Oz. Troy, Official U. S. Treasury price, June 3, $35.00. **Scrap Gold,** 6¾c. per pennyweight per karat, dealers' quotation. **Platinum,** oz. Troy, $30.00.

Duties: Copper, 4c. lb.; zinc, 1¾c. lb.; tin, free, lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	U S. Import Duty	Tax*
No. 1 Yellow Brass	7.75	None	4c. lb.[1]
85-5-5-5	9.50	None	4c. lb.[1]
88-10-2 (June 1)	12.75	None	4c. lb.[1]
80-10-10	11.00	None	4c. lb.[1]
Manganese Bronze (60,000 t. s. min.)	9.75	None	4c. lb.[1]
Aluminum Bronze	13.75	None	4c. lb.[1]
Monel Metal Shot or Block	28	25% a.v.	None
Nickel Silver (12% Ni)	11.50	20% a.v.	4c. lb.[1]
Nickel Silver (15% Ni)	15.00	20% a.v.	4c. lb.[1]
No. 12 Aluminum	16.50-20	4c. lb.	None
Manganese Copper, Grade A (30%)	18-23	25% a.v.	3c. lb.[1]
Phosphor Copper, 10%	11.25-14	3c. lb.	4c. lb.[1]
Phosphor Copper, 15%	13.25-15	3c. lb.	4c. lb.[1]
Silicon Copper, 10%	18.30	45% a.v.	4c. lb.[1]
Phosphor Tin, no guarantee	61-75	None	None
Iridium Platinum, 5%	$32-33	None	None
Iridium Platinum, 10%	$33-34	None	None

*Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1]On copper content. [2]On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	7¼ to 7⅜	Free	4c. per pound on copper content
Light copper	6 to 6¼	Free	
Heavy yellow brass	4 to 4¼	Free	
Light brass	3⅝ to 3⅞	Free	
No. 1 composition	6 to 6¼	Free	
Composition turnings	6	Free	
Heavy soft lead	3.90 to 4	2⅛c.lb	None.
Old zinc	2½ to 2⅝	1½c.lb.	
New zinc clips	3½	1½c.lb.	
Aluminum clips (new, soft)	13½ to 13¾	4c.lb.	
Scrap aluminum, cast	12½ to 12¾	4c.lb.	
Aluminum borings—turnings	6¼ to 6½	4c.lb.	
No. 1 pewter	29 to 30	Free	
Electrotype	4 to 4¼	2⅛c.lb.*	
Nickel anodes	29½ to 31	10%	
Nickel clips, new	32 to 33	10%	
Monel scrap	11 to 19	10% a.v.	

*On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since May 4, 1936. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	17 c.	2½c. lb.
Bare wire, soft, less than carloads	13¼c.	25% a. v.
Seamless tubing	17½c.	7c. lb.

*Each of the above subject to import tax of 4c. lb. in addition to duty, under Revenue Act of 1932.

BRASS AND BRONZE MATERIAL

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	
Sheet	15⅛c.	16 c.	16⅞	4c. lb.	U. S. Import Tax 4c. lb. on copper content.
Wire	15⅜c.	16¼c.	17⅛	25%	
Rod	13⅛c.	16¼c.	17	4c. lb.	
Angles, channels	22⅞c.	24 c.	24⅝	12c. lb.	
Seamless tubing	17⅜c.	18 c.	18⅞	8c. lb.	
Open seam tubing	22⅞c.	24 c.	24⅝	20% a.v.	

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	28⅜c.	10% Quality	27 c.
15% Quality	26½c.	15% Quality	31⅜c.
18% Quality	27¾c.	18% Quality	34⅝c.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound.	(Duty 4c. lb.; import tax 4c. lb. on copper content.)
Tobin Bronze Rod	17 c.
Muntz or Yellow Rectangular and other sheathing	18⅜c.
Muntz or Yellow Metal Rod	14½c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb. 32.80
Aluminum coils, 24 ga., base price, ton lots, per lb. 30.50

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	49c.	Cold Rolled Sheet	53c.
Hot Rolled Rods	44c.	Standard Sheet	48c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	34	Standard Sheets (base)	38
Cold Drawn Rods (base)	39	Cold Rolled Sheets (base)	43

SILVER SHEET

Rolled sterling silver (June 3) 47c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.50	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' price)	10.25	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' price)	14.25	2c. lb.
Full Lead Sheet (base price)	8.00	2½c. lb.
Cut Lead Sheet (base price)	8.25	2½c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty Free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 246.

Supply Prices, May 29, 1936

ANODES

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 500 lbs. or more, and subject to changes due to fluctuating metal markets.

Copper: Cast	16½c. per lb.	**Nickel:** 90-92%	.45 per lb.
Electrolytic, full size, 14½c. cut to size	14½c. per lb.	95-97%	.46 per lb.
Rolled oval, straight, 15¼c.; curved,	16¼c. per lb.	99%+cast, 47c.; rolled, depolarized, 48.	
Brass: Cast:	17½c. per lb.	**Silver:** Rolled silver anodes .999 fine were quoted June 3, from 48c. per Troy ounce upward, depending on quantity.	
Zinc: Cast	10⅛c. per lb.		

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.95/lb.	$2.65/lb.	$2.45/lb.
10-12-14 & 16	2 to 3½	2.85	2.55	2.35
6-8 & over 16	1 to 2	3.05	2.75	2.55
6-8 & over 16	2 to 3½	3.00	2.70	2.45
6 to 24	Under ½	4.25	3.95	3.75
6 to 24	½ to 1	3.95	3.65	3.45
6 to 24	Over 3½	3.35	3.05	2.85
		Any Quantity		
4 to 6	Under ½,	$5.00	½-1, $4.85	1 to 3, $4.75
1½ to 4	"	5.55	" 5.40	" 5.35
1 to ½	"	5.85	" 5.70	" 5.60

Extras: 25c per lb. on wheels, 1 to 6 in. diam., over 3 in. thick. On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less are quoted:

16" 20 ply 84/92 Unbleached	$71.13
14" 20 ply 84/92 Unbleached	54.58
12" 20 ply 84/92 Unbleached	41.09
16" 20 ply 80/92 Unbleached	59.37
14" 20 ply 80/92 Unbleached	45.64
12" 20 ply 80/92 Unbleached	34.45
16" 20 ply 64/68 Unbleached	51.26
14" 20 ply 64/68 Unbleached	39.47
12" 20 ply 64/68 Unbleached	29.86
⅜" Sewed Buffs, per lb., bleached or unbleached	48c. to 1.12

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P.	lb.	.09-.14½
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.05¼-.05¾
Chromic, 400 or 100 lb. drums		.16¾
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06½
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.05-.06¼
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl, drums	lb.	.09½-.12
Denatured, drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.03½
Powdered, barrels	lb.	.0340-.0365
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.55-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.0245-.0295
Cadmium oxide, 50 to 1,000 lbs.	lb.	1.05
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.06
Chrome, Green, commercial, bbls.	lb.	21½-23½
Chromic Sulphate, drums	lb.	.33-.55
Copper—Acetate (Verdigris)	lb.	.21
Carbonate, 53/55% cu., bbls.	lb.	.15½
Cyanide (100 lb. kgs.)	lb.	.38-.40
Sulphate, tech., crystals, bbls.	lb.	4.55-5c.
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs.,	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
*Gold Cyanide, Potassium		$15.45
*Gold Cyanide, Sodium		$17.10
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.016
Lead—Acetate (Sugar of Lead), bbls.	lb.	.10-.13½
Oxide (Litharge), bbls	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) Pure, drums	gal.	.42½
Nickel—Carbonate, dry, bbls.	lb.	.35-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.13½-.14½
Salts, double, 425 lb. bbls.	lb.	.13½-.14½
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07¼-.08½
Potassium—Bichromate, casks (crystals)	lb.	.09
Carbonate, 96-98%	lb.	.07½
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.08
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.38
Cyanide, 100 oz. lots	oz.	.46-.50
Nitrate, 100 ounce lots	oz.	.32¾
Soda Ash, 58%, bbls.	lb.	.0252
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	17½-.22
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	2.80-3.30
Nitrate, tech., bbls.	lb.	.02¼
Phosphate, tribasic, tech., bbls.	lb.	.03
Silicate (Water Glass), bbls.	lb.	.01½
*Stannate, drums	lb.	.31-.34
Sulphocyanide, drums	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02
*Tin Chloride, 100 lb. kegs	lb.	.36
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11-.12
Cyanide (100 lb. kegs)	lb.	.028-.037
Chloride, drums, bbls.	lb.	.37
Sulphate, bbls.	lb.	.07½-.10

*Subject to fluctuations in metal prices.